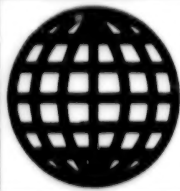


25 October 1995



**FOREIGN
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FBIS Report —

Science & Technology

Central Eurasia

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**Microstructure and Physical Properties of
 $\text{Ti}_{50}\text{Ni}_{50-x}\text{Fe}_x$ Alloys With Shape Memory. II. Elastic
Properties**

957A1103A Yekaterinburg FIZIKA METALLOV I
METALLOVEDENIYE in Russian Apr 95
Vol 79 No 4, pp 70-76

[Article by V.G. Pushin, V.N. Khachin, L.I. Yurchenko, S.A. Muslov, L.Yu. Ivanova, A.Yu. Sokolova, Institute of Physics of Metals at the Urals Department of Russia's Academy of Sciences and Republic Engineering and Technical Center at the Siberian Department of Russia's Academy of Sciences, Tomsk; UDC 669.15'24'295:539.32]

[FBIS Abstract] Alloys and compounds which undergo martensitic transformation with an abnormal behavior of their elasticity moduli in the premartensitic state and the elastic anisotropy parameters which characterize the degree of the crystal's relative resistance to two given types of shear strain are discussed. It is stressed that in many metastable metals, alloys, and compounds, various unusual behavior characteristics of their elastic properties are observed on the threshold of a martensitic transformation-type phase transition. The findings obtained by measuring the elastic properties and internal friction of polycrystals and single crystals of quasibinary alloys with a TiNi-TiFe cross section within a broad temperature range are analyzed and the measurement methods and procedures are described. In particular, the premartensitic state is characterized by a unique softening of the elasticity moduli whereby the elastic anisotropy parameter changes from 0.5 to 2 within a broad temperature and concentration range of states. The study reveals that B2→B19 alloys which undergo martensitic transformation are characterized by a premartensitic increase in the elastic anisotropy parameter A while on the other hand, A begins to decrease approaching unity on the eve of the B2→R martensitic transformation, which indicates that the B2 lattice softening is isotropic. The need to examine the microscopic aspects of the premartensitic phenomena and the microstructure development characteristics of the products of martensitic transformation is emphasized. Figures 4; tables 1; references 17: 12 Russian, 5 Western.

**Microstructure and Physical Properties of
 $\text{Ti}_{50}\text{Ni}_{50-x}\text{Fe}_x$ Alloys With Shape Memory. II.
Electron Microscopy of Premartensitic States**

957A1103B Yekaterinburg FIZIKA METALLOV I
METALLOVEDENIYE in Russian Apr 95
Vol 79 No 4, pp 77-86

[Article by V.G. Pushin, L.I. Yurchenko, V.N. Khachin, L.Yu. Ivanova, A.Yu. Sokolova, Institute of Physics of Metals at the Urals Department of Russia's Academy of Sciences and Republic Engineering and Technical

Center at the Siberian Department of Russia's Academy of Sciences, Tomsk; UDC 669.15'24'295:539.27]

[FBIS Abstract] The study of the elastic isotropic softening accompanied by a decrease in all moduli of elasticity whereby the elastic anisotropy parameter remains constant within a broad temperature and concentration range of states (*Fizika metallov i metallovedeniye* 1995, Vol 79 No 4, pp 70-76) is continued. It is noted that this behavior results in a complex pattern of diffuse X-ray scattering and a change in the level of Bragg's reflection and inelastic neutron scattering by metastable B2 alloys and is also accompanied by an abnormal behavior of the Debye temperature, phonon spectrum, and RMS atomic displacements, both dynamic and static. Attempts to obtain more detailed data on diffuse scattering and the real microstructure of TiNi-TiFe alloys and their evolution in the premartensitic state prompted transmission electron microscopy and electron microdiffraction studies, including *in situ* experiments carried out by directly heating and cooling foils under the microscope. The experimental procedure of the electron microscopy and electron diffraction studies of the quasibinary cross section is described, and the characteristics of the electron diffraction and diffuse electron scattering typical of the premartensitic state on the eve of the martensitic transformation, both B2→R and B2(R)→B19', are analyzed in detail. Models of the premartensitic state's microstructure in metastable alloys are investigated. The study shows that in a premartensitic state, TiNi-TiFe alloys display a tendency toward forming a quasiperiodic microstructure in the form of a three-dimensional domain grid which, in a first approximation, is described by an FCC lattice whose <100> axes are aligned with those of the matrix while the parameter varies within 20-60 nm. It is noted that similar properties are displayed by domains with PSS-2 (transitional shear structure) with tetrahedral or orthorhombic lattice distortions. Figures 6; references 14: 9 Russian, 5 Western.

**Effect of Nitrogen Implantation on Titanium Foil
Durability**

957A1103C Yekaterinburg FIZIKA METALLOV I
METALLOVEDENIYE in Russian Apr 95
Vol 79 No 4, pp 161-168

[Article by V.I. Shalayev, V.N. Mizgulin, V.N. Kuznetsov, T.N. Kochetkova, N.V. Gavrilov, Institute of Physics of Metals at the Urals Department of Russia's Academy of Sciences; UDC 669.295:539.12.04:539.376]

[FBIS Abstract] The ability of ion implantation (II) to improve both the mechanical and corrosion properties of surface layers in metallic materials prompted an investigation into the durability τ and long-term ductility ϵ_p of titanium foil in a cold strained state and after nitrogen implantation at a varying rate. The study demonstrates the following: cold strained foil ductility

Main Results of and Tasks for Implementation of Nontraditional and Renewable Energy Sources in Ukraine

957A0885A Kiev *ENERGETIKA I ELEKTRIFIKATSIYA* in Ukrainian
No 2, Mar-Apr 95 pp 39-42

[Article by Candidates of Technical Sciences V.G. Shulga, B.P. Korobko and M.M. Zhovmir (NEE [expansion not given] State SRI); received 4 Aug 94; UDC 620.92]

[FBIS Translated Text] When assessing the status of the industry, science and technology and potential resources of each type of power and possible technical and economic parameters one should give priority in development for the nearest term to wind power, small hydraulic power, the use of heat pumps, photoelectric power, the use of sun collectors and the use of geothermal water for heating.

Despite low wind velocity in most regions of Ukraine wind power potential is fairly high for intensive development of the wind power industry. Theoretical resources, i.e. kinetic energy of wind, within Ukraine's territory exceed the current production of electric power by approximately a factor of 1500, while resources on land which can be used at the current level of wind power development exceed it by a factor of two. It is possible to put to work much larger resources by using water-based wind-power plants, first of all sea-based ones, where winds are stronger and more stable. Thus, just the wind power potential in the Sivash Bay is 50 to 100 percent higher than the current energy production in Ukraine.

The Crimea, Carpathians, the Black and Azov Sea coasts and Donets Basin are the most favorable regions for construction of high-power wind-power plants (WPPs). However, this does not mean that it is not expedient to develop wind power in other regions. In addition to using self-contained wind-power plants which are more wind-sensitive (have lower inertia) in these regions one can build there powerful WPPs on individual land elevations. It is possible to build here four WPPs (sic). Three of those are already in operation. Pre-design calculations are under way for another eight sites.

First results of operation of pilot wind-power electric plants indicate that they are competitive with thermal power plants (TESSs). Thus, the cost of electric power produced at the Donuzlava WPP is estimated at 1 cent/kWh (due to inflation of karbovanets prices are given in U.S. dollars) whereas when using fuel oil or natural gas it is approximately 3 cents/kWh. When using experimental wind-power plants AVE-250S manufactured by

VO [production association] "Pivdenny mashinobudivnyy zavod" the cost of electric power is estimated at 2.3 cents/kWh, which is also acceptable compared to electric power produced at TESSs using imported energy carriers.

It is worth noting that it is impossible to achieve the above results when purchasing wind-power plants abroad at world prices. At the same time it should be noted that wind-power plants "USW 56-100" that have been series-produced in Ukraine since 1994 using the documentation of U.S. Windpower Company and "ABE-250C" do not take sufficiently into account specific features of wind potential of Ukraine and therefore must be modernized or replaced with other models. Otherwise their use will be severely limited.

Taking into account the need to use the wind potential in all regions of Ukraine more efficiently, wind-power plants with a wide range of capacity are being developed based on components manufactured in Ukraine.

It is possible to improve substantially technical and economic parameters of WPP operation by building them on seas and in inland water basins. Kherson TsKB [central design bureau] "Izumrud" proposed a technology for flow-line assembly, installation and adjustment of wind-power plants in a dry dock, hauling them, ready for operation by water transportation and installing them on pilings in sea using the floating method. With fortuitous choice of the installation site technical and economic parameters of WPP operation (energy output, cost and ROI) can be improved by 50-100 percent and even more. Therefore, a most important task for the immediate future is to conduct comprehensive examination and debugging of the technology in 1994-1995 in order to begin construction of several 1000 MW WPPs as early as 1996. For instance, at the Odessa bank in the Black Sea one can build a 10,000 MW WPP, and there are even better opportunities in the never freezing Sivash Bay and in the Azov Sea.

WPPs have a substantial advantage over TESSs, AESs and GESs. The investment is practically not "frozen" because, for instance, a "USW 56-100" wind-power plant begins power generation a week after being brought to a WPP construction site.

By using the water power of small rivers it is possible to generate about 50 billion kWh a year, which is four times more than is generated currently at operating GESs. The equipment for small GESs is simpler and less expensive compared to wind-power plants and can be manufactured in Ukraine. However, for small GESs (we are talking both mini- and micro-GESs) to provide high quality and competitive electric power it is necessary

to organize production of automatic control systems for them.

It is expedient to use heat pump plants to provide for basic heat loads where there are natural or technogenic sources of low potential heat with temperatures 5-40°C and higher, when for 1 kWh of electric power used 3.5-4.5 times more thermal power with parameters sufficient for local heating systems can be generated. Under these conditions heat pump plants are competitive, both power- and expense-wise, even compared to highly economically efficient boiler plants. In southern regions of Ukraine where premises must be air-conditioned one can use heating-cooling reversing conditioners.

Analysis of foreign experience, preliminary work on patterns for the use of heat pumps (HPs) in various branches of Ukraine's national economy, and estimates of their power and economic and ecological efficiency indicate that in order to reduce importation of expensive and critical energy carriers (natural gas, oil and petroleum products) a strategy of developing the fuel and energy complex must include the following:

- reorientation of the electric power industry toward the use of coal with appropriate ecological measures;

- conducting a state policy aimed at reducing the use of imported natural gas and petroleum products in heating systems (heating and industrial boiler rooms) by wide use of HPs, mainly electrically driven ones.

Such integrated approach will make it possible to reduce consumption of primary fuel by 12 million metric tons a year and of natural gas and petroleum products in local heating systems by 17 million metric tons of equivalent fuel a year, improve the ecological situation due to reduced consumption of fuel for heating, and provide even loading of AESs and coal-burning TESs due to operation of HPs according to a mandatory schedule of electric power consumption.

By organizing combined heat and cold generation using the heat pump technology in existing enterprise cooling systems the additional heat supply capacity can be as high as 1050 MW.

The use of electrically driven class "water-air" compression heat pumps in heating and ventilation systems of industrial shops, pumping stations and greenhouses can provide total heat loads of up to 4900 MW.

The use of electrically driven compression heat pumps for heating and cooling of farms and heating and supplying hot water for individual residential buildings, resort complexes, sanatoriums, hotels and small industrial enterprises can provide heat loads of up to 1800 MW, and

the use of absorption HPs for the above customers can provide heat loads of up to 100 MW.

In Ukraine HPs can be manufactured by enterprises specializing in manufacturing of cooling equipment: VO "Melytopolkholodmash", VO "Odesakholodmash" and VO "Krystal" (Kharkov). VO "Melytopolkholodmash" is mastering production of piston HPs with heat capacity of 9 to 65 kW, including units for utilization of heat losses of high power transformers. The Compressor Machine Building SRI (city of Sumy) is developing an HP with up to 1000 kW capacity that uses screw compressors.

Absorption HPs with 10, 30, 60 and 1000 kW capacity have been developed by the Technical Thermal Physics Institute, NAN [National Academy of Sciences] of Ukraine, and can be manufactured per customer orders.

The main stages and first and foremost tasks related to wide use of HPs in the national economy of Ukraine stipulate development of legislation that creates conditions for their economically efficient use, organization of production of equipment and development of demonstration heating systems in the power industry, manufacturing processes, public services and daily life, and for ensuring mass-scale use of HPs replacing direct electric heating in heating systems.

In the year 2000 Ukraine's total capacity for thermal energy generation by heat pump plants can be as high as 100 MW, which will make it possible to reduce consumption of petroleum products and natural gas by 300,000 metric tons of equivalent fuel a year, and in 2010 these parameters can be 1800 MW and 1.8 million metric tons, respectively. It should be noted that the current total thermal capacity of HP plants in Western Europe is around 3,000 MW.

When using solar energy it is necessary to place special emphasis on priority development of photoelectric power. There are extremely favorable conditions for this in Ukraine: availability of high quality raw materials, a strong infrastructure and series-production technology for manufacturing monocrystalline silicon and photoelectric converters, which makes it possible to ensure stable high world class quality parameters (efficiency of 80 x 80 photoelectric converters is as high as 13-14 percent, short-circuit current 2.4-2.6 A, open-circuit voltage 0.56-0.58 V, peak capacity over 1 W).

Solar batteries made of such converters will be competitive in world markets. Ukraine has conditions to organize in a short time production of up to 10 MW of solar batteries a year. As far as technical and economic parameters are concerned, for some time photoelectric power will not be able to compete with electric power

generation at TESs, but in some areas its higher efficiency is obviously even now. Among them are self-contained power sources for radio relay communication systems, signal signs, advertisement, lighting for parks, parking lots and bus stations, and portable TV and radio equipment. The interbranch program for improvement of photoelectric converters stipulates their cost reduction by 33 to 50 percent and increasing their efficiency to 18 percent over two to three years. This will make it possible to develop photoelectric plants that are competitive with organic fuel-burning TESs.

Solar water heating collectors—a simple in principle device for utilization of solar radiation energy. But a state-of-the-art economically efficient and reliable solar collector has not been series-produced in Ukraine. Collectors manufactured by our industry are expensive, inefficient and unreliable. A 1 m² solar collector saves up to 200 kg of equivalent fuel over a season and recoups the investment in five to seven years.

In developed countries solar collectors are used not just for hot water supply and heating for self-contained customers, i.e. stand-alone buildings, but also in regional centralized heating systems and even at TESs.

In Ukraine several versions of hot water supply and heating systems using solar collectors and various types (compression and absorption) of heat pumps have been developed and are being debugged. Such systems will be debugged at a number of facilities of industrial power generating associations, such as "Krymenergo", "Vinnytsyaenergo", "Lvivenergo", "Donbasenergo" and "Ukrenergoresursy". Creation of working model facilities in each oblast, with their construction financed by Minenergo associations, would considerably accelerate wide scale use of solar collectors. These facilities could include hot water supply systems for PEM [expansion not given] and REM [expansion not given] shops and workshops, departmental kindergartens, camps and recreation bases, schools etc.

Main conditions for wide use of geothermal power in the national economy of Ukraine are its vast resources, relatively low specific investment in power generating facilities, equipment simplicity and relatively low cost of generating thermal, and in many cases also electric, power.

Among the regions where economically very efficient systems and units for utilization of geothermal power could be implemented are the Transcarpathian oblast, western part of Galicia, most part of the territories of the Kharkiv, Poltava, Donetsk, Lugansk, Chernigiv and Kherson oblasts, northern part of the Crimean peninsula and southern part of the Zaporizhzhya and Odesa oblasts. Preliminary calculations indicate that

geothermal resources in these regions are equivalent to 600-700 billion metric tons of equivalent fuel.

Ukraine's industry is capable of mastering production of necessary equipment for GeoTESs [geothermal thermal power plants]. Most components of equipment for SGTs [expansion not given] are currently manufactured in Ukraine for other purposes, and it can be used in geothermal power industry. At the initial stages it is expedient to use imported equipment.

It is planned to implement the program of developing geothermal power industry in several stages. During the first stage it is proposed to perform geological prospecting in various regions of the country. Based on the obtained data it will be possible to build SGTs and GeoTESs. During this stage it is also planned to build and commission experimental GeoTESs with 1 to 10 MW and SGTs with 2 to 20 MW capacity and to widely use geothermal power at oil and gas fields using the existing well stock.

During the second stage experimental work will be conducted at research and industrial sites, technology and equipment for building 25-100 MW GeoTESs and 50-200 MW SGTs will be developed, geological prospecting for new deposits will be expanded, new equipment will be built at these sites, and the sites will be developed. Research work will be completed and technology and equipment will be developed for extracting the heat from "dry" mountain masses. It is expected that as a result of completing the work during this stage GeoTESs with the total capacity of 200-250 MW and SGTs with the total capacity of 600-700 MW will be operating in Ukraine.

During the third stage the process of creating a resource-material base of the geothermal power industry will be completed. During this stage GeoTESs and SGTs will be built in most regions of the country. As a result of completing the complex of work during this stage a level of geothermal power utilization will be achieved that will provide for replacement of 7 to 10 percent of Ukraine's demand for organic fuel.

Among the obstacles inhibiting wide use of renewable energy sources is natural unevenness of power generation in the course of a day, season and year. At the same time consumption of electric and thermal power also changes, so power generation and consumption schedules do not match. Therefore, and especially for local heating and electric systems, power accumulation is necessary. As far as accumulating thermal power the problem is solvable because it is possible to create large seasonal heat accumulators for large power and heat generation systems for villages, cities or their rayons by using existing natural geological "lenses" thermally and hydraulically isolated from moving ground water or

very deep anthropogenic cavities such as coal, salt and other depleted mines.

The use of nontraditional renewable energy sources will be successful if one can find application areas commensurate with the potential of each such source. One should take into account the fact that the best technical and economic parameters will be achieved in the case of combined generation of thermal and electric power and when combining this with traditional power industry equipment and technology.

On the whole one can assume that at the current stage the development of nontraditional power industry in Ukraine has sufficient scientific support. The situation with technical support is much worse because up until now no serious attention has been paid to the development of appropriate technology. According to estimates the use of renewable energy sources can be profitable compared to traditional power if the cost of 1 kW of installed capacity (in world prices) will be 600-800 U.S. dollars for electric and 150-200 U.S. dollars for thermal power. In stand-alone devices the cost of electric power can be much higher.

At the current state of technology mass-scale use of renewable energy sources will only become possible after developing promising competitive equipment and mastering perfect technologies for manufacturing it. This is possible with appropriate State incentives by direct investment in scientific research and R&D and providing tax and credit breaks to the developers, manufacturers and operators of technology for nontraditional and renewable energy sources.

Precision Servomechanism Components With Inertial Motion Control and Active Vibration Abatement

957A0954A Moscow IZVESTIYA AKADEMII NAUK: TEORIYA I SISTEMY UPRAVLENIYA in Russian No 3, May-Jun 95 (manuscript received 20 Nov 94) pp 109-115

[Article by A.A. Krasovskiy, Air Force Engineering Academy imeni N.Ye. Zhukovskiy, Moscow, UDC 62-50]

[FBIS Abstract] Precision servomechanism drives with inertial motion control and active vibration abatement are considered, vibration abatement being achieved by integrating the drive and the suspension into one structure. Such a construction utilizes the elasticity of the suspension and the generally nonlinear load characteristics of the drive so that the condition of a "zero rigidity" effect can be approached. A design and performance

analysis of such drives is based on calculation of the acting forces. Under consideration are: 1. single-step electromagnetic drives with springs and one degree or two degrees of useful freedom for use in systems such as automatic manipulators of industrial robots, 2. magnetopiezoceramic drives for devices such as instrument transducers operating in a small interaction space. Various conventional drives (electromechanical, electrofluidic, pneumatic) are deemed to be sufficiently precise for operation in a large interactive space. Precise stabilization of drives in an inertial space of gravitational field for optimization of their precision requires precise measurement. Adequately precise and sensitive direct measurement of forces in one channel and of displacements in a second channel can be made with inductive transducers. Extremely precise and sensitive such measurements can be made with laser interference interferometers. There may be added a third channel with an accelerometer. Measurements of this kind are demonstrated on an electromagnetic drive with nonmagnetic springs and one degree of freedom operating in the presence of a wideband additive noise. The theory of such measurements for its stabilization is based on the $m\ddot{x} + \Delta F + mg$ equation describing a unidirectional forward motion (ΔF - force of drive, m - mass of drive generally distributed rather than lumped, x - displacement, t - time, g - acceleration of gravity assumed to be constant). For the purpose of a perturbation and vibration analysis, this equation rewritten as one in a three-dimensional state space with $\dot{dx}/dt = Ax$ ($A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$). Attenuation of the effect of perturbations can be adequately well demonstrated with such a low-order $\dot{dx}/dt = Ax$ model, unless a diversity of $g(t)$ perturbation modes and spectra is involved. Figures 2; references 8.

Digital Extremum Control Algorithms Based on Statistical Piecewise Linear Identification

957A0954B Moscow IZVESTIYA AKADEMII NAUK: TEORIYA I SISTEMY UPRAVLENIYA in Russian No 3, May-Jun 95 (manuscript received 3 Jan 94) pp 116-122

[Article by V.Yu. Arkov and G.G. Kulikov, Ufa State Aircraft Engineering University, Ufa; UDC 681.5.015.27]

[FBIS Abstract] Considering that digital automatic control systems are capable of real-time storing and process large data volumes and that use of statistical methods can improve the quality of control, statistical identification and specifically a piecewise-linear one is proposed for extremum control of dynamic objects. Considering further that during normal operation of a control system in the object-stabilizing mode there takes place a

random travel of its operating point closely around the steady state, it is proposed that a sample of instantaneous values of both the output signal and the control signal be used for real-time identification of the static characteristic of the object and for subsequent calculation of the control actions which will keep the control parameters in the vicinity of the extremum. The procedure is demonstrated on a closed digital automatic control system consisting of a comparator, a regulator, a servomechanism, a transducer for measuring the output coordinate, and a filter. Three of these components (servomechanism, transducer, filter) are lumped together with the object into an "equivalent control object" which, for simplicity, is assumed to be one of the first order. Identification of the static characteristic is followed by extremum search, the aim being to maintain the extremum value of the object's controlled coordinate at every instant of time. This in turn requires identification of the extremum point on the object's static characteristic and selection of control which will correspond to the position of that extremum point. As a specific example is considered digital control of a turbopropeller motor on an aircraft cruising at a constant speed at constant altitude, in which case the control system must stabilize both propeller speed and thrust. The controlling factors are propeller pitch and rate of fuel consumption, such a motor operating most economically when a given amount of thrust will be maintained with minimum fuel consumption. This requirement is taken care of by a regulator which also includes an optimization circuit with propeller speed correction. The corresponding digital control algorithm is constructed suitably for implementation on an on-board computer with both speed regulation and thrust regulation facility. Figures 4; references 4.

Calculations Relating to Flow of Saturated Vapor Through Pipes

957A0955A Moscow ZHURNAL VYCHISLITELNOY MATEMATIKI I MATEMATICHESKOY FIZIKI in Russian Jun 95 Vol 35 No 6, (manuscript received 17 Nov 94, revised version received 1 Feb 95) pp 977-987

[Article by T.Ya. Grudnitskaya, V.I. Zubov, V.N. Koterov, V.M. Krivtsov, A.V. Shipilin, and A.V. Shcheprov, Moscow; UDC 517.958:533.7]

[FBIS Abstract] A mathematical model of flow of a vapor-water mixture is constructed suitable for describing the flow of wet steam, i.e., of saturated vapor car-

rying water droplets, through pipes in thermal electric power plants. The model consists of three equations representing the laws of mass, momentum, and energy conservation. These equations are formulated for a one-dimensional flow, but can be expanded to fit a multidimensional one. The density of the mixture is the sum of vapor density and water density, the ratio of water density to vapor density being very small in an only slightly wet steam. With the water droplets uniformly distributed over the vapor volume and moving with the vapor at the same velocity, the pressure and the temperature are approximately equal to those of the vapor. The temperature-dependent latent heat of phase transition is also taken into account, along with the wetness distribution factor, in energy calculations. The internal energy of the vapor and that of the water are functions of pressure and density, as is the heat of vaporization and the temperature. The kinetics of the wetness distribution will depend on the degree of unbalance between the processes of water droplet condensation, buildup, breakup, and evaporation. The algorithm of flow calculations for such a system is based on Godunov's numerical two-step method of differences [S.K. Godunov, A.V. Zabrodin, M.Ya. Ivanov, et al.; "Chislennoye resheniye mnogomernykh zadach gazovoy dinamiki" (Numerical solution of problems in gas dynamics), Izd. Nauka, Moscow 1976], with the following two modifications. On the first step is added a suitable procedure for solving the problem of decay of any arbitrary separation in a medium with variable wetness. On the second step is added calculation of the mass-momentum-energy flux in a new time layer, which is done by using the equations of state and with the aid of tables. In this way are calculated the thermodynamic parameters and can be simulated the flow of steam through intricate pipe segments. Both the steam model and the calculation method have been applied to two problems arising in the design of steam pipe networks. One problem is to evaluate the dependence of the steam flow parameters in a straight pipe with uniform rectangular cross-section on the thermodynamic properties of the steam. The other is problem is to simulate the flow of steam through a pipe system consisting of two alternate high-drag inlet segments, a valve, pipes, a bend, and more pipes. The valve being here the key element, the behavior of the flow parameters during its opening and closing movements has been demonstrated by simulation of transient flow of steam in a valve moving at a constant speed to both open and to close in a total time of 1 s. Figures 4; references 10.

Block of Glutamatergic and Cholinergic Ionic Channels by Adamantane Derivatives

957A0567A Moscow FIZIOLOGICHESKIY ZHURNAL SSSR IMENI I. M. SECHENOVA in Russian (manuscript received 17 Mar 94) Vol 80 No 7, Jul 94 pp 99-112

[Abstract of article by L.G. Magazanik, S.M. Antonov, N.Ya. Lukomskaya, N.N. Potapyeva, et al., Institute of Evolutionary Physiology and Biochemistry imeni I.M. Sechenov; Russian Academy of Sciences, Institute of Experimental Medicine, Russian Academy of Medical Sciences, St. Petersburg, Russia; University of Pittsburgh, USA, UDC 612.814+577.15/17]

[FBIS Abstract] A study showed that terms of a homologous series of adamantane derivatives of the general formula $\text{Ad-CH}_2\text{-N}^+\text{H}_2\text{-(CH}_2\text{)}_5\text{-N}^+\text{R}_3$, where Ad and R varied from H (hydrogen) to t-Bu (tert butyl) can block the open state of post-synaptic ionic channels. Experiments on frog neuro-muscular preparations under the effect of these substances showed that the decrease of cholinergic post-synaptic currents became biexponential but the rate constants of interaction of the blocker with the channel practically did not depend on the R structure and the membrane potential. The rate of blockade of glutamatergic post-synaptic currents in a neuro-muscular compound of an insect increased in proportion to the appearance in the nitrogen atom of heavier radicals but did not depend on the membrane potential. The substances studied were potent and "rapid" blockers of glutamate channels of the N-methyl-D-aspartate [NMDA] type, registered in the membrane of cultivated rat cortical neurons. Affinity of the substances for the open channel increased e times during hyperpolarization at 25 mV. All substances prevented convulsions caused by intraventricular injection of NMDA into mice. The substance IEM-1754, possessing the highest effects on single ionic channels in the experiment, had six-fold higher anticonvulsive effect than dizocilpine (MK-801). The molecular mechanism of interaction of the blockers with different types of post-synaptic ion channels was discussed. Figures 4; references 22: 2 Russian; 20 Western.

Data on Epidemiology and Epizootiology of Tick Typhus in Kazakhstan

957A0929A Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian No 1, Jan-Feb 95 (manuscript received 19 Dec 93) pp 96-97

[Article by D. Ch. Tsoy and L. P. Rapoport, Shymkent Plague-Control Station, Kazakhstan]

[FBIS Translated Text] Key words: tick-borne typhus, North Asia, Kazakhstan

Epidemiology and epizootiology of North Asia tick typhus were studied on the territory of South Kazakhstan and Zhambyl oblasts in the Kazakhstan Republic.

A total of 1,365 people, 4,264 wild mammals of 11 species, and 1,513 farm animals, including 845 head of cattle, 267 sheep and goats, 205 horses and 196 camels, were submitted to serological testing. In addition, the biotest method was used on 1,103 wild mammals and 311 Ixodes ticks.

The complement fixation test (CFT) with antigen from *Rickettsia sibirica* was conducted on blood serum samples using the conventional technique. Guinea pigs, which were infected intraperitoneally with an emulsion of wild mammalian brain or tick suspension, served as biotest animals. In all we used 167 guinea pigs. Euthanasia was carried out with chloroform in closed biotest jars. CFT on serum from wild and farm animals was considered positive when it showed titers of 1:10 or more (in humans, titers of at least 1:10 were considered anamnestic).

Seropositive individuals were found among residents of 8 out of the 11 rural administrative rayons tested. Positive reactions constituted a mean of 3.07 percent. CFT titers constituted 1:40 to 1:160 in 5 out of the 42 individuals with positive reactions, and this is most probably indicative of recent tick North Asian typhus. Seropositive specimens constituted 3.2 percent among cattle, 5.2 percent among sheep and goats, and 2.0 percent among camels.

Rickettsia were found in three species of Ixodes ticks, greater and crested gerbils, yellow susliks, and house mice. Specific antigens were also found in red-tailed jirds, common field mice, and Kirgiz voles.

The study of endemicity of North Asia tick typhus was prompted by the existence in South Kazakhstan of at least three types of endemic sites for this disease: sandy desert, foothill semi-desert and desert steppe sites, mountain steppe sites.

In the first type of sites the greater gerbil is the chief host of the pathogen. In the population of this species, the percentage of seropositive animals in years of increase in their number is very high reaching 14.0, dropping to almost zero in periods of depression. There is very wide spread infection among greater gerbils. Seropositive animals were found in all regions surveyed. Epizootics of North Asian tick typhus were demonstrable in the population of greater gerbils for three consecutive years, which is indicative of stable persistence of the pathogen. Among the additional hosts of *Rickettsia* in the northern sandy deserts (Muyunkumy) we inspected was the yellow suslik, in the population of which the percentage of seropositive specimens is usually rather

high here (mean of 4.3), and in the southern region (Kyzylkumy) the large population of midday gerbils. *Hyalomma asiaticum* and *H. turanica* are the main vectors. Evidently the epidemiological foci are very active because many livestock breeders are situated right in the sandy regions. The number of seropositive individuals constituted 3.2 percent of those tested.

The yellow suslik, house mouse and crested gerbil are the main hosts of the pathogen in the second type of site. Among the above-mentioned species, seropositive specimens constituted a rather high figure, reaching 7.0, 3.0 and 5.4 percent, respectively. The large population of Kirgiz voles in some regions, in which seropositive animals were found at the mountain steppe sites, could serve as additional hosts of *Rickettsia*. *H. asiaticum*, as well as *H. plumbeus* that is found in large numbers almost everywhere, are the main vectors. The hosts are not demonstrable in all areas from which material was collected for testing, which is indicative of sporadic spread of infection.

The common field mouse and probably in some areas the Kirgiz vole are the main hosts in endemic mountain steppe sites. Specific antibodies were found in one out of the five mice trapped there. The large population of common field mice on the ridges of the Kazakhstan portion of North and West Tyan Shan is evidence of the special role this species plays in sustaining natural endemicity of North Asia tick typhus. Evidently, the main vectors are *Dermacentor marginatus* and *Haemaphysalis punctata*, which are known as *Rickettsia* vectors in analogous landforms of neighboring Kirgizia. There is mass scale parasitization by the preimago phase of these ticks on small mouse-like rodents. The obtained data enabled us to conclude that there are three types of active natural sites of North Asia tick typhus in South Kazakhstan: sandy desert, foothill semi-desert and desert steppes, and mountain steppes. Farm animals as the source of food for *Ixodes* ticks and *Rickettsia* carriers are of some importance to the epidemiology of this disease.

Demonstration of seropositive individuals among the inhabitants of South Kazakhstan and Zhambyl oblasts confirms the relative wide distribution of North Asia tick typhus in the southern part of Kazakhstan. The absence of officially recorded human cases of North Asia tick typhus is indicative of unsatisfactory identification of this infection and of the need for further investigation of its epidemiology.

'New' Rickettsiosis in the Spotted Fever Group in Astrakhan Oblast

957A0929B Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian

*No 1, Jan-Feb 95 (manuscript received 11 Apr 94)
pp 98-100*

[Article by I. V. Tarasevich, V. A. Makarova, and N. F. Fetisova, RAMS Research Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, Moscow, Russia]

[FBIS Translated Text] Key words: Rickettsiosis in spotted fever group, isolation of pathogen, incidence.

For the last 10 years a previously unknown disease characterized by prolonged high fever, myalgia, arthralgia, maculopapular rash and others has been recorded in Astrakhan Oblast of the Russian Federation. Each year there was aggravation of clinical symptoms of patients, which caused increase in their hospitalization. With the current level of morbidity the economic detriment due to this infection was estimated at 24-30 million rubles per year (in prices prevailing on 1 June 1993).

At the present time, there are known cases of "Astrakhan" fever in the city of Astrakhan and 80 populated areas mainly in rayons adjacent to the Volga-Akhtuba floodplain. Since 1983, when the first clinical cases were described, there has been a marked trend toward rise in morbidity; the incidence per 100,000 population showed a 20-fold rise in 10 years. There is typically a stable high morbidity level in Krasnoyarskiy Rayon due to a greater extent to the waste discharged from a condensed gas complex put on line in the mid-1970s (it constituted 85.3 percent of all cases in 1991).

In the last few years there has been expansion of the range of Astrakhan fever. Territories have been found where the disease is recorded each year (city of Astrakhan, Krasnoyarskiy, Narimanovskiy and Privolzhskiy rayons), and it was recorded regularly from year to year in 33 villages.

Mainly adults are stricken; 48.6 percent of the cases occur at the age of active fitness for work, from 20 to 49 years. The disease is recorded more often in men (61.3 percent) than in women. There are no data about a connection to occupational activities of patients. Both the indigenous population, particularly from endemic regions, and individuals who live there during leaves, vacations, business trips, etc., are at equal risk. No direct person to person contact infection has been noted. Average data covering monthly distribution of sick cases over a period of many years indicate that the largest number of cases occur in August, isolated cases being noted in April and October. From 96 to 98 percent of the cases are recorded annually from May to September.

As a result of door to door rounds carried out in Astrakhan Oblast (1990-1991) it was established that the

public has regular contact with *Rhipicephalus pumilio* canine ticks and that dogs are infested with them.

In a questionnaire given to the public special attention was given to determination of how the ticks were eradicated: 58.2 percent of the respondents squashed the ticks which had been removed from dogs or themselves, 34.5 percent burned them, while the rest of the polled residents (7.3 percent) used other methods. When infected ticks are squashed, the aerogenic or contact route of infection may acquire predominant significance in the absence of a primary effect.

Yard foci of "Astrakhan" fever were found among family members and their relatives who had dogs in hyperendemic Krasnoyarskiy Rayon for several years. The patients' epidemiological history revealed contact with tick-infested dogs.

In 1990, two strains of *Rickettsia* in the tick-borne spotted fever (TSF) group were isolated from the blood of "Astrakhan" fever victims. Blood was drawn from the patients at an early stage (3d-5th day of illness) at the height of the febrile reaction before the start of antibiotic intake. Golden hamsters weighing 40-45 g and developing chick embryos were used to isolate the strains. We analyzed 19 samples of blood from "Astrakhan" fever patients. Blood clots were thoroughly triturated and injected intraperitoneally to golden hamsters in a dosage of 1.0 ml. The animals' temperature was taken and they were sacrificed at the height of the febrile reaction; suspensions were prepared from the testes and vaginal tunics for infection of chick embryos. We used the complement fixation test (CFT) with TSF group rickettsial, typhus group and *Coxiella burnetii* antigens on the 28th day from on serum from pairs of hamsters in each biological sample. As a result, we isolated for the first time two strains of *Rickettsia* (AR-1 and AR-2) from the blood of patients living in the hyperendemic region who had dogs and had removed ticks from them. In addition, we found complement-fixing antibodies (CFA) to soluble CFT group rickettsial antigens in six biotest specimens taken for the study of pairs of serum samples, in the absence of antibodies to typhus group and *C. burnetii* antigens. Thus, TSF group rickettsia were demonstrated in 8 out of the 19 tested samples.

In order to demonstrate naturally occurring rickettsia carriers and isolate strains of *Ixodes* ticks, we carried out biotests on golden hamsters and chick embryos (1991) or biotests on guinea pigs and chick embryos (1992).

In 1991, biotests were used to examine 139 *R. pumilio*, *R. rossicus* and *Dermacentor marginatus* ticks. We were unable to isolate rickettsial strains, but presence of TSF group rickettsia in tick suspensions in 3 out of 11 tested

samples was confirmed with use of the CFT with TSF group antigens on pairs of golden hamster serum samples. In 1992, 196 *R. pumilio* ticks collected from dogs, hedgehogs and cats were submitted to biotesting on guinea pigs and chick embryos. The ticks were distributed in the samples according to collection site and their condition. Guinea pigs (males weighing 360-380 g) were given intraperitoneal and intratesticular injections of 2.0 and 0.5 ml tick suspension, respectively. We used 20 percent suspensions prepared from testes with vaginal tunics, spleens and brain for subsequent passages in guinea pigs. We carried out two passages with each material. CFA to antigens of TSF group rickettsia in titers of 1:10 for those infected for the first time to 1:160 for animals submitted to passages in 9 out of the 13 tested samples from pairs of guinea pigs. TSF group rickettsial strains were isolated from eight biological specimens. These strains were isolated among the ticks collected from dogs (6 strains), hedgehogs (1) and cats (1). Thus, this is the first time that there was demonstration of the role of *R. pumilio* as a vector of the pathogen of "Astrakhan" fever.

The "Astrakhan" fever rickettsial strains we isolated did not differ from other TSF group rickettsia in morphological or tinctorial properties. We studied the nature of experimental infection induced by these rickettsia on guinea pigs, golden hamsters and mongrel white mice after intraperitoneal injection of 10^5 MIDE [minimum infecting dose for chick embryos]. We used ovocultures of rickettsia from the 6th and 15th passages.

After intraperitoneal injection of 6th passage ovoculture to golden hamsters weight 40-45 g 42 percent of the animals died on the 6th-8th postinfection day presenting signs of marked peritoneal rickettsiosis with considerable accumulation of rickettsia in mesothelial cells of the vaginal tunic, the febrile period lasting 5-6 days. After injection of ovocultures of 15th passage rickettsia animal deaths constituted 20 percent; there was insignificant accumulation of rickettsia in mesothelial cells, and the febrile period lasted 2-3 days. In mongrel white mice, intraperitoneal injection of 6th passage rickettsial ovocultures elicited death of 35-65 percent of the animals on the 5th to 7th postinfection day, depending on their age. The animal death rate was considerably lower after administration of 15th passage ovocultures.

A benign febrile illness was noted in male guinea pigs after administration of 15th passage ovocultures, the febrile reaction lasting 1-3 days but with insignificant temperature elevation.

We used serological analysis of antigenic structure in the CFT with species-specific immune serum from mongrel white mice and entirely soluble antigens of

group TSF rickettsia for intragroup differentiation of strains of "Astrakhan" fever rickettsia isolated from the blood of sick humans. The cross CFT was used to examine serum samples immune to the AR-1 strain of "Astrakhan" fever rickettsia, Netsvetayev strain of *R. sibirica*, M-1, Sevastopol and Barabash-Levada strains of *R. conorii*, and AL strain of *R. akari*, as well as the corresponding entirely soluble rickettsial antigens.

Titers of CFA to homologous antigen in serum samples immune to the AR-1 rickettsial strain did not exceed 1:10-1:40 in the absence of complement-fixing antibodies to antigens of *R. sibirica* and *R. akari*. Titers of CFA to *R. conorii* antigens were usually absent, with the exception of isolated cases when equally low titers (1:10) of CFA were found to both "Astrakhan" antigen and *R. conorii* antigens in the absence of complement-fixing antibodies to *R. sibirica* and *R. akari* antigens. In mouse serum immune to *R. conorii*, titers of 1:40-1:80 were found for CFA to homologous antigens, 1:10 for CFA to antigen of the "Astrakhan" rickettsial strain AR-1, with no CFA to antigens of *R. sibirica* and *R. akari*. It was established by biological, serological and genetic (together with Dr. D. Raul, Marseille) that the strains isolated from patients' blood and ticks were identical. The demonstrated strains have both similarities to and differences from the *R. conorii*, which is the pathogen of Mediterranean spotted fever. The isolated strains were referred to the "Conorii complex."

**Synthesis and Biological Activity of
1-O-alkyl-methoxy-sn-glycero-3-phosphocholine
From Alkylglyceryl Ethers Isolated From Liver of
Commander's Squid**

957A0548A Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Feb 95 Vol 29 No 2, (manuscript received
24 Feb 94) pp 17-18

[Article by V. I. Kulikov, G. I. Muzya, S. M. Orlov, A. A. Popkov and Ye. V. Berdyshev, Biolipid Scientific Production Enterprise, Moscow; Marine Biology Institute, Far Eastern Department, Russian Academy of Sciences, Vladivostok; UDC 615.273.015.4:612.111.7]

[FBIS Abstract] In this research 1-alkyl-2-methoxy-sn-glycero-3-phosphocholine was synthesized using alkylmonoglycerides isolated from the alkylglyceryl ethers of liver fat of Commander's squid. In the prepared compound V (whose structure is shown in a diagram) the alkyl chain contains a set of fatty alcohol residues initially present in the alkylglycerin ethers of the liver fat. An analysis of the fatty alcohol residues of the isolated alkylmonoglycerides indicated that in their composition there is a predominance of C16:0 (77.8 percent) and C18:0 (14.2 percent) alkyl residues; the C18:1, C16:1

and C14:0 alkyl residues are present in small quantities. A study of cytotoxic activity indicated that the compound V in concentrations 10-100 and 50-100 μ M effectively inhibits proliferation of human K-562 leukemic cells and P-815 mouse mastocytoma cells respectively. The compound V to a small degree activates oxidative metabolism in human neutrophils. The compound V in a concentration 10^{-6} M also stimulates the aggregation of human thrombocytes, but to a lesser degree than the phospholipid thrombocytic activation factor. Accordingly, the polysynthetic preparation V, containing primarily C16:0 alkyl residues, is on a par with the foreign preparation ET-18- OCH_3 , containing the C18:0 alkyl residue. In addition, the considerable improvement in the synthesis scheme by use of natural initial compounds and the availability of considerable quantities of unused initial raw material (squid liver fat) suggests that this synthesis scheme may be more suitable for industrial production of the foreign product ET-18- OCH_3 and its derivatives. References 15: 7 Russian, 8 Western.

**Synthesis and Study of Pharmacological Activity of
Derivatives of**

5-dimethylaminopyrano[3.2-c]quinolin-2-ones]

957A0548B Moscow
KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Feb 95 Vol 29 No 2, (manuscript received
1 Mar 94) pp 31-34

[Article by I. N. Nesterova, L. M. Alekseyeva, N. I. Andreyeva and S. M. Golovina, Center for Pharmaceutical Agents — All-Russian Chemical Pharmaceutical Institute; UDC 615.221:547.823.012.1]

[FBIS Abstract] A simple method is proposed for synthesizing derivatives of 5-dimethylaminopyrano[3.2-c]quinolin-2-ones, involving use of 4-chloro- or 4-oxo-3-formylquinolones with compounds having an active methylene group. The pharmacological activity of the synthesized compounds (designated Ib,c,d with their derivatives IV, VII) are each studied and described in detail. In particular, several were used in emotional-stress and neurochemical tests for determining their antihypoxic and antispastic properties and acute toxicity. These tests were with mice of both sexes. The compounds were administered internally 60 minutes before a swim or pressure chamber test, administration of a maximum electric shock or intake of some neurochemical agent. All the studied compounds had an activating effect, as indicated by a decrease in immobility of the animals in a behavior test and a decrease in reserpine effects, an intensification of the hyperthermic effect of L-DOPA and the spastic effect of 5-oxytryptophan. All these effects were observed with administration of the compounds in a dose 25 mg/kg. With compound

doses 25-50 mg/kg there is a tendency to an antihypoxic effect and with doses 100-200+ mg/kg several of the compounds exhibit an antispastic effect. Some have psychotropic properties, suggesting that research along these lines should be continued. Figures 2; references 7: 3 Russian, 4 Western.

**A New Phenomenon Induced by
Ion-Conformational Interaction in Biomembrane
Channels**

957A0992A *Moscow BIOFIZIKA in Russian*
Vol 40 No 1, Jan-Feb 95 pp 86-94

[Article by G. E. Vainreb and V. N. Kharkyanen, Vidguk Medical Scientific Research Center, Ukraine; submitted 23 Nov 93]

[FBIS Abstract] Generally accepted physical principles and a body of experimental data were used to construct a model of stochastic differential equations to describe conformational mobility in ion channel structures, thereby making it possible to study ion channel behavior, such as volt-ampere characteristics and the duration and probability of the open state, and to account for ion conformational interaction. Since this interaction is precisely what gives rise to discrete levels of conductivity, it is thought to play a key role in ion channel functioning. The formal description of the conformational mobility of channel-forming protein presented herein makes it possible to describe both the classical properties of excited membrane ion channels and the processes by which the ion current affects channel function as it flows through. Incorporating ion-conformational interaction into the model could lead to the appearance of a fundamentally new phenomenon: molecular self-organization. Due to functional disequilibria, self-organization is possible only if there is sufficiently strong "pumping" into the system. In this case, one of the basic properties of ion channels — the presence of discrete levels of conductivity — is explained by the possible existence of bistable functional capacity as a manifestation of self-organization. Thus, the observed disappearance of the closed state when ion flow approaches zero has a natural physical explanation: bistability disappears near equilibrium. Systems in which discrete levels of conductivity are observed, with both positive and negative currents, must be described using models having a minimum of two points of intersection, while models with one point of intersection show bistability only for currents of one charge sign. This study was partially funded by the Ukrainian GKNT [State Committee on Science and Technology] basic research fund. Figures 4; references 27: 13 Russian, 14 Western.

**Theoretical Approach To Determining
Membranotropic Activity of Regulator Peptides**

957A0992B *Moscow BIOFIZIKA in Russian*
Vol 40 No 1, Jan-Feb 1995 pp 95-97

[Article by B. R. Mogilevich, G. V. Ostrovskaya, and V. K. Rybalchenko, Scientific Research Institute of Physiology at Kiev University imeni Taras Shevchenko; submitted 24 Jan 94]

[FBIS Abstract] A theoretical approach was developed to determine the membranotropic activity of regulator peptides. The average value of hydrophobicity (H_p), the ratio of hydrophilic to hydrophobic amino acid residues (R_p), and the discriminant function Z (a linear combination of H_p and R_p) were calculated. This makes it possible to determine with a high degree of probability whether a protein is "membrane-active" and the manner in which it binds to a membrane. Oxytocin, substance P, and angiotensin II, the membranotropic activity of which are known, were chosen as the model peptides. The calculations were checked against experimental data. It was found that oxytocin, substance P and angiotensin II have many characteristics of membrane-binding proteins. Using the amino acid content of the peptides as a starting point, it is possible to predict the possibility of interaction of with the membrane's lipid matrix for all three peptides. Also, by calculating the values of R_p , H_p , and Z , the location of the peptide molecules in the membrane can be determined. Thus, the calculations performed show that it is possible to determine the characteristics of regulator peptides, which indicate their membranotropic activity and make it possible to fix the probable position of regulator peptides in the membrane matrix. Tables 2; references 6: 4 Russian, 2 Western.

**Induction of Slow cAMP-Sensitive Sodium Current
in Mollusk Neurons Using G-Protein Activators**

957A0992C *Moscow BIOFIZIKA in Russian*
Vol 40 No 1, Jan-Feb 95 pp 110-114

[Article by Ye. I. Solntseva, O. V. Borisova, V. G. Skrebitskiy; Institute of the Brain at the Russian Academy of Medical Sciences, Moscow; submitted 17 Dec 93]

[FBIS Abstract] GTP-binding protein (G-protein) activators were injected into mollusk neurons to determine the effect on the cyclic adenosinemonophosphate (cAMP)-sensitive slow sodium current. The neurons were isolated from the visceral ganglia of grapevine snails without first pre-treating the ganglia with proteolytic enzymes. Two intracellular microelectrodes were used to clamp membrane potential at -60 mV. One

of these electrodes was also used for the intracellular injection of the cAMP and the G-protein activators (fluorine ions, guanosine triphosphate, and 5'-guanylylimidodiphosphate). The experiments were carried out on those neurons that, at that potential, generated an input current in response to the cAMP injection. After the cAMP-response was registered, the G-protein activators were injected into the cells. It was found that, in those neurons in which the cAMP induces a slow sodium current, the G-protein activators can induce both an input and an output current. The incoming G-current was similar to the cAMP-current in terms of activation kinetics, potential dependence, and reverse potential magnitude. Two possible mechanisms for G-current generation were described. The first involves G-protein stimulation of adenylylase and the subsequent synthesis of cAMP, which activates the stationary sodium current. The second is through direct activation of sodium channels by G-proteins, bypassing the cAMP system. It is possible that both mechanisms are used simultaneously. It was also found that in some cells with cAMP-sensitive sodium channels, the injection of G-protein activators did not activate the channels, but instead generated a current in the opposite direction. This may be due to the natural absence of the specific G-proteins necessary to initiate the sodium current. It was concluded that G-protein activators can activate slow cAMP-sensitive sodium channels. Figures 2; references 17: 5 Russian, 12 Western.

Hamilton LaGrange Method: A Theoretical Basis for Studying Self-Organization of Model and Real Biotechnical Systems

957A0992D Moscow BIOFIZIKA in Russian
Vol 40 No 1, Jan-Feb 95 pp 132-136

[Article by E.V. Sergeyev, Ye. F. Aksyuta, and C. Ya. Bokser, Shuya State Pedagogical Institute imeni J. A. Furmanov; submitted 16 Dec 1992, 7 Jul 1993]

[FBIS Abstract] A theoretical investigation was conducted of the self-organization (i.e. the order, disorder, and openness) of "man-apparatus" functional biotechnical systems (FBTSs) within the framework of the Hamilton-LaGrange principle of least action. The problem was posed in terms of an equation in which the minimum of activity, S_{min} , is equal to the integral of $L_0 d\tau$ between limits 0 and τ , where L_0 equals kinetic energy minus potential energy of the system. This forms the basis for calculating the integral parameters of the system. The results obtained were compared to data from concrete FBTSs having one or fewer subsystems. Discrepancies between theoretical and empirical results are ascribed to the specific characteristics of the FBTSs used in the trials. It is suggested that the Hamilton-LaGrange

method be used as a comparative approach to quantitative measurement of the self-organization of FBTSs. Figures 2; references 15: Russian.

Pediatric Institute Sees Decline in Children's Health
957A0498A Moscow TRUD in Russian 17 Mar 95
p 6

[Article by Olga Ganeyeva: "Today Children Are Ill, and Tomorrow the Whole Country Will Be Suffering"]

[FBIS Translated Text]

According to data of the Moscow Research Institute for Pediatrics and Children's Surgery, four percent of teenagers have chronic illnesses toward the end of the school year. By the end of the school term, the number of healthy children is reduced by a factor of four, and 30-50 percent of six-year-old children are not ready for enrollment in school. "The rise in chronic pathologies in children and teenagers today is a real threat to the health and a full life of those who will be living tomorrow," says Academician Yuriy Yevgenyevich Veltishchev, director of the institute. This is what he said in a conversation with our correspondent:

"From our patients we see that every year the number of so-called high risk patients is increasing. We have observed chronically ill girls for a twenty-year cycle. Practically all of them after growing up 'communicated' their disease or a predisposition to it to their own offspring. If in the very near future a real, but modest change in government policy does not ensue for the interests of the rising generations, especially for its health, the number of chronically ill children will grow even higher.

Allergy is becoming a global disease. It is, like congenital defects, an indicator of an unhealthy environment. In some regions, 13 percent of the children are born with congenital and inherited diseases. By keeping in mind the serious ecological situation and the low healthy diagnostics of defects, it is possible to predict further intensification of the process. New technologies are needed in diagnostics — and they exist, but we cannot adopt them: there are no funds.

[Boxed item: If in the 1960's there were four cancer patients per 100,000 children, in 1993, there were 11.]

A gradual rise in childhood ecological diseases is observed. If there were four cancer patients per 100,000 children in the 1960's, in 1993, there were 11. Until now there has been no leverage for action on this process, and, therefore, in the future we predict a rise in such diseases to 20 per 100,000.

Infectious diseases have threatened, are threatening, and will threaten us. Viruses and microbes, which are all around us, have learned to adapt — mutation of the microworld has taken place. Tuberculosis is progressing — its bacilli have become more resistant. Diphtheria, whooping cough, and measles are not surrendering. If the fierce campaign against vaccination of children does not cease, we expect a further rise in these infectious diseases. The probability of cholera this summer looms again.

The pathology of the gastrointestinal tract is a very painful problem of today's pediatrics. Almost one in five school children suffers chronic disease of digestive organs. According to Nutrition Institute data, today children obtain only half of the normal recommended levels. They do not have sufficient proteins, vitamins, and microelements. A large number of the young suffer from anemia. In addition, a new trend has appeared: up to 12 percent of children have pathological obesity because of starchy food lacking in substances necessary for growth of the organism.

Diseases of the **nervous-mental sphere** produces special concern. This is a subject for a separate long conversation. I shall say only that their frequency is increasing progressively. Today, neurosis to a certain degree is observed in almost all children. Add here the low activity, the lack of fresh air, the absurd overloads in school, the daily television insanity — and you obtain a prediction for future days, years, and decades.

Diseases of the **cardiovascular system** today have become, alas, our pediatric problems. We have run into a new phenomenon of the century — **myocardial infarct in children**. Several children with infarcts have been in our clinic in the last three years. Hypertonic crises in teenagers and the disturbance of brain blood exchange are an unfavorable trend which is apparent, unfortunately, here also. Atherosclerosis and hypertonia are early forms of ischemia heart disease — all this has "grown younger" so much that in the very near future, probably, it will become firmly established in the category of childhood diseases.

And now, let us draw some conclusions. The only way out of the crisis situation today is **the maintenance of a state system for protecting the health of mother and child**. The introduction of commercial and insurance (pay for service) medicine does not lead to a prophylactic, preventive approach to the health of children. Insurance medicine has to pay for today's cancer or heart disease. What insurer will invest money to prevent allergy? His funds are directed only toward curing it. The development of commercial medicine in all

events strikes a blow to budgeted medicine, including pediatric medicine. A blow to our future.

Stricter Health Criteria Proposed for Recruits

957A0498B Moscow IZVESTIYA in Russian
2c Feb 95 pp 1,4

[Article by Viktor Litovkin, IZVESTIYA: "Only the Healthy Should Serve in the Army, Although the Unhealthy Do Not Know This."

[FBIS Translated Text]

A very interesting document has come into my hands. It is called "Information on the Medical Problems of Troops Recruited by Conscription." The paper was drawn up by military and civilian specialists and is intended for study by members of the government, different levels of deputies, and directors of local administrations.

The document gives evidence of a number of servicemen unnecessarily called up for military service and discharged from it ahead of time because of poor health status, although it has decreased by 30 percent, which still comprises a very large number, almost 2,000 men. The greatest number of such men came into the army from the Moscow region (464), from the North Caucasus (359), and the area around the Volga (290). A third of them are diagnosed with chronic disease of the nervous-mental system. And half the cases are the result of formal testing by young physicians.

What is the matter? On the one hand, it is insufficiently qualified physicians who have been recruited for medical examination of conscripts, the poor quality of medical documentation reaching the military commissariat from outpatient clinics and diagnostic centers, where future wars ought to take into account. And most important is the catastrophic state of health of our teenagers.

The document confirms that 53 percent of the students graduating from school have debilitated health, and a third of those examined from the European part of the country suffer from a different kind of anemias, neuroses, phobic reactions, and encephalopathies. Physicians say the reasons for this basically are poor nutrition, an irregular lifestyle, and a multitude of harmful habits.

In two administrative districts of Moscow alone — the Southwestern and the Northwestern — there is noted a rise by more than one-fourth of diseases of the endocrine system (disorder of digestive organs and disturbance of the metabolism of substances), the circulation system, the osteomuscular system, and connective tissues. According to the doctors, the number of cases of so-called social diseases in young people has

risen several fold: syphilis, by a factor of 5, tuberculosis, by a factor of 2, mental disorders, by 15 percent, and gonorrhea, by 5 percent.

On average, according to the Moscow military commissariat, the number of young men dismissed from conscription into the army because of diagnoses of illnesses of the motion-support apparatus, enuresis, urolithic disease, prostatitis, organic affection of the central nervous system, psychopathy, and refraction anomaly has doubled.

The military physicians confirm that such a rise in unhealthy teenagers takes place not only because of their tendency to avoid military service (especially in connection with Chechen developments). And more important — the army needs healthy people, they maintain. And a comparatively new order of the Ministry of Defense No 68 of 1993 (it supplements Order No 436 of 1991 — V.L.) toughened the requirements for the status health of conscripts.

Military doctors confirm that almost all men who have any chronic disease even with insignificant disturbance of the functions of an affected organ or system are not subject to conscription for military service.

Now, for example, as before, persons with gastrodermatitis (inflammation of the stomach and duodenum), with consequences of infectious diseases and trauma of the central nervous center with hypertonia, with all the congenital or acquired heart defects, with ulcers, with chronic or habitual dislocations of extremities or enlarged joints, with absence of the thumb on the right hand, with hemorrhoids with varices, with chronic maxillary sinusitis, and with widespread (total) and nidus forms of alopecia and depigmentation, ought not to serve in the army.

Those who are unwell with bronchial asthma or oligophrenia, those suffering from a slight degree of debility or enuresis, people with diseases of the endocrine system (thyroid gland, sugar diabetes even in a light form) or with the after-effects of trauma of the spinal cord and brain, also have the right not to serve in the army.

It is true that the military medical commission will discuss and take into consideration documents on the existence of such diseases not in the case in which they appeared in a person the day he was brought before the military commission but in that case in which he was found to have been under constant medical observation for several years.

Persons who have eyesight of 6 diopters also should not be conscripted into the military. (Incidentally, one can serve in the American army with 10 diopters. The

Finnish army accepts those suffering from bronchial asthma, hypertonic disease, and stomach and duodenal ulcers. The specialists say it is a matter here not only of the stricter requirements of our medical documents, but also the living conditions and geographic conditions of military service. The same Finns serve in practically the same climate, not far from home, and upon discharge can go home to mama and papa. But our recruits frequently change from the steppe region to the taiga, from the south to the Far North, from the city to unpopulated backwoods, and their health needs, naturally, are completely different.)

For this same reason, there are different health requirements for future soldiers and future officers. Although they discharge a conscript with chronic diseases, such an "allowance" is not granted to a student suffering from the same ailment who has studied an army specialty at a military department of an institute of higher learning and has obtained a reserve officer rank. It is believed that an officer serves under more comfortable conditions than a soldier. Yet given the present state of the army and its living conditions, this approach is hardly acceptable, especially in the Chechen war.

The military physicians believe that the health requirements of future fighters must be made even tougher. **The army in any case must conscript absolutely healthy people.** At the same time, it is necessary to be directed not by departmental orders but by the All-Russian State Legal Documents. The plan of the regulation of military medical expertise was prepared some time ago. It corresponds completely to the letter of the military laws of Russia and almost two years ago was transmitted for examination by the governmental law administration for the president of Russia, and from there in March 1994 it went to the department supervising the work of the administrative agencies of the government apparatus. And now not a word has been heard since.

And meanwhile violations of legal and civil law by people suffering from one or another disease continue for conscripts. What is to be done in such cases?

At the same time, specialists advise following the requirements of articles 25-27 of the law "Military Duty and Military Service," an act is needed on the health status, which must be issued by a medical institution conducting an investigation on the management of military combat. This act involves the conscription commission of the rayon, city, and oblast, where the fate of a future war or "war game" is decided. And to appeal an unsatisfactory — in the opinion of the conscript — verdict, a ten-day appeal period is possible. At the same time, as the law requires, the order to send the youth

into the army must be suspended until the court has made a decision.

Health Ministry To Study 'Yellow Baby' Problem

957A0498C Moscow ROSSISKIYE VESTI—RETSEPT in Russian 18 Feb 95 p 12

[Article by 'Andrey Demin: "Blank Spots," the "Yellow Baby" Phenomenon]

[FBIS Translated Text] **The material with which Candidate of Medical Sciences Andrey Demin, consultant of the Administration of the President, makes our readers acquainted today has been compiled from an analytical memorandum edited by Oleg Chernovyrdin, secretary of the Safety Council of the Russian Federation.**

What kind of a problem is this, which concerns high-ranking government officials? The "yellow baby" phenomenon is already well known from publications in the press. A working conference on "yellow babies" was held in September last year upon the initiative of Aleksey Yablokov, chairman of the Intergovernmental Commission on Ecological Safety. Then it was explained that there are so many "blank spots" in it that until they are studied, the phenomenon may be considered a potential threat to national health.

All 14 ministries and departments of the Interdepartmental Commission of the Safety Council were included for study of this potential threat. The commission also sent corresponding inquiries to a number of Russian regions. Oleg Lobov also put collected material on the table. The reader already knows what happened after that.

Now, knowing the history of the material presented, we turn to its informational direction.

A disease of the newborn occurred in the Altay Kray of Southern Siberia and in Bashkir in 1989, which received the common name "yellow babies," comprises 40 percent of the total number of newborns.

Up to this time, medicine has not given a clear definition of the "yellow baby" phenomenon. It is known that disorders of newborn health appear in damage to the nervous system, in the development of an unclear origin of pathological jaundice, and in the long (1-3 months) duration of the jaundiced period, usually requiring intervention to preserve the life of the baby. Subsequently, the majority of the babies (48-80 percent of the cases) develop anemia, have slower physical development, and have disorders of the kidney and adrenal glands; sometimes congenital anomalies arise, and disorders of brain and cerebrospinal blood circulation are transformed into

disorders of the central nervous system function, requiring special treatment for 2-3 years (60 percent of the cases). It is necessary for 35-40 percent of the affected babies to have even longer treatment. The infant mortality reached 38.2 per 1,000 live births in 1989 (compared to 11.2 per 1,000 in 1988) because of this pathology in the Loktevsk Rayon of the Altay Kray.

The "yellow baby" phenomenon first appeared at the end of the 1980's in Southern Kazakhstan (Pavlodarsk Kray and Semipalatinsk Oblast). According to data of the Altay public health agencies, a sharp jump in morbidity among newborns in this kray was noted in 1989.

In 1989-1992 the number of rayons of the Altay Kray with the spread of the phenomenon increased from 2 to 5. According to forecasts of local public health agencies, in 1995-1996 an additional jump in the increase of this pathology is expected (this is related to the entry of the 1975-1979 birth generation into the reproductive age — the second generation after the powerful radiation effect in the 1950's).

According to unofficial data, the "yellow babies" are being born in a number of rayons of the Astrakhan Oblast, in Bashkir (city of Salavat), and the Orenburg Oblast (Totsk Settlement Region). Where else? In order to answer this question the Interdepartmental Commission on Ecological Safety sent special inquiries to a number of Russian Federation oblasts and the following answers were received.

In Arkhanyelsk Oblast territory in August 1994 the jaundice syndrome appeared in 20 percent of the total number hospitalized. Jaundiced babies came from all rayons of the oblast, most frequently from Solombalsk, Isagorsk, and Plesetsk.

The Tula Oblast recorded jaundice of a different origin among newborns, the greatest number of cases of which were in 1992.

The Lipetsk Oblast over a period of five years also noted a rise in jaundice. In all the larger cities of the oblast (Lipetsk, Elts, Usman, and Dankov) the number of children with jaundice increased from 1990 to 1993 by a factor of 6.5.

Maternity home specialists in the area of the Orenburg Oblast also verify from year to year the increase in the number of newborns suffering from jaundice of different etiologies.

And the occurrence of "yellow babies" in the Kemerovo Oblast has been noted since the 1980's. The frequency of the origin of pathological jaundices comprises 29.5 percent (basically, children are ill in the cities of Kemerovo and Yugra).

It appears that if this problem is studied intently, the newborn yellow jaundice phenomenon of unclear genesis may appear anywhere.

Several hypotheses exist from the reasons for the occurrence of "yellow babies."

The first hypothesis is related to the action of the radiation factor. The effect of nuclear explosions on the Semipalatinsk testing area was suggested by the administration of the Altay Kray as one of the most important reasons for the phenomenon. The coincidence of the area of the phenomenon with the maximal radiation loads in the 1950's-1960's, and also the occurrence of this newborn illness indirectly confirms this. The first information about the increase in morbidity of newborns and of the mortality from anomalies appeared after entry into reproductive age of the generation which had been subjected to radiation contamination in childhood in 1949-1962.

Separate unofficial data on the "yellow baby" phenomenon in the Orenburg Oblast, which is related to the use of nuclear weapons during military training in 1956 at the Totsk firing range, provide another indirect confirmation of the radiation origin of the phenomenon.

Confirmation of the radiation hypothesis is possible by selecting data on the effect of an analogous radiation factor on other places (Chernobyl, West Ural, and the Novaya Zemlya zones affected by radiation).

However, a number of studies consider that not only the radiation factor should be considered as the cause of the "yellow baby" phenomenon. The fact that the area of the phenomenon does not coincide with the maximal radiation load in the 1950's-1960's serves as a counterargument; the birth of "yellow babies" was not observed before 1993 inclusively in Rubsovsk, Zarinsk, and also the Ugrovsk rayons, which were subjected most to the action of radiation. In addition, the results of questionnaires from women showed that 70 percent of Altay mothers giving birth to ill babies in 1990-1991 came from different cities of Russia and the CIS. On the other hand, among women giving birth to healthy babies, 71 percent were local inhabitants.

The following hypothesis is presented briefly. The action on pregnant women of natural microtoxins, including T-2 toxin and its metabolites contaminating up to 60-70 percent of samples of grain and grain products in adverse regions of the Altay Kray, is suggested by the Federal Administration of Medical and Biological Problems as one of the basic factors for the origination of "yellow babies." Studies of contaminated products (flour, groats) taken from families where women have given birth to ill children are offered as evidence. In

an experiment on animals consuming these products, a number of pathological shifts were obtained which were analogous to those observed in mothers and newborns.

In order to confirm the hypothesis about the microtoxin nature of the "yellow baby" phenomenon, further screening of food products is necessary, especially in the Altay Kray, and also in other regions of Russia with analogous natural-climatic conditions and a large amount of stored grain and grain products (Krasnodar Kray, Rostov and Astrakhan Oblasts).

The Novosibirsk Hygiene and Occupational Pathology Scientific Production Association suggests the action of chemical contamination, and most of all, of rocket fuel components, on the population as the basic hypothesis for "yellow baby" occurrence in the Altay Kray. At the same time attention is drawn to the fact that the Talmenka Rayon has rocket parts, and the Tretyakov Rayon of the Alta Kray is the place of the fall of a second stage rocket launched from Baykonur. However, a number of arguments gives evidence against this hypothesis: four other rayons of the Altay Kray with the "yellow baby" phenomenon (Smolensk, Altay, Loktevsk and Rebrikhinsk) lack rocket bases; rayons of the cities of Aleysk and Biysk, where the probability of environmental contamination by rocket fuel components is great, have no cases of the birth of "yellow babies;" no such phenomenon is observed in multiyear observation of the population living in other regions which are sufficiently contaminated by rocket fuel components.

Other possible reasons for pathological jaundice are identified.

Undoubtedly there is the effect of the social factor, the lifestyle. According to data of the Pediatrics Institute of the Russian Academy of Medical Sciences, more than 20 percent of the children of alcoholics encounter pathological forms of jaundice (alcoholism in Altay is higher by a factor of 2-2.5 than the average for Western Siberia).

In the opinion of the Public Health Department of the Arkhangel Oblast administration, the increase in jaundiced newborns may be related to the total ecological disharmony in the oblast.

A clear relationship is noted in the Lipetsk Oblast between jaundice in the newborn with the unsatisfactory health status of mothers in which the role of the ecological factor is large.

In Kemerovo, "yellow baby" families in 60 percent of cases also lived in ecologically unfavorable rayons (Kirovsk and Zavodsk). Fathers of children basically work at chemical enterprises (46 percent), and mothers usually have a burdensome obstetrical anamnesis.

In a word, with all the lack of clarity about the nature of the phenomenon, the problem is about the occurrence of a new mass form of pathology related to an ecologically unfavorable environment. If attention is not paid to this problem immediately, it may acquire serious significance for national safety.

What then needs to be initiated?

First of all, eliminate the "blank spot" in the phenomenon, conduct the corresponding scientific research work directed at a study of the problem and the basis of medical-social measures for prevention and rehabilitation of the afflicted population. A special federal program is also needed.

It is possible to include work on the determination of the true scales of the danger and the development of preventive measures in the programs "Ecological Safety in Russia" (Ministry of Natural Resources, Russia), "Safe Maternity", (Ministry of the Health and Medical Industry, Russia), and "Children of Russia" (Ministry of Social Protection, Russia).

The State Committee for Sanitary Food Inspection of Russia must take into account the occurrences of the phenomena in large industrial centers with a developed chemical industry in a system of social-epidemiological monitoring.

And, finally, through the World Health Organization, it is necessary to call upon world experience in the field of newborn illnesses related to unfavorable ecological situations.

To Preserve and Increase Soil Fertility

957A0632A Moscow ZASHCHITA RASTENIY
in Russian Mar 95 No 3, pp 4-5

[Article by A.G. Hazarchuk, Minister of Food and Agriculture, Russian Federation]

[FBIS Translated Text] I am not a novice in agricultural production. The path of my career has gone from rank-to-file agronomy to oblast director, and I am not acquainted with village difficulties by hearsay. Land users have many problems today, and one of the keys which directly affects the harvest and quality of production is the supply of mineral fertilizers and plant protection agents. Their effect shows up not only in the year of use, but also in the following two or three years.

The Russian Ministry of Food and Agriculture is charged with the development and implementation of the State Comprehensive Program for Increasing the Soil Fertility of Russia, the Implementation of the Protection of Plants From Weeds, Pests, and Diseases, and Environmental Protection. This work is done by the

State Agrochemical Service, which includes 113 centers and stations. About 10,000 highly skilled agricultural chemists and specialists of the rayon and agricultural agrochemical laboratories work here. The State Plant Protection Service consists of 1,576 oblast and rayon plant protection stations with 890 observation posts for warning and forecasting of the emergence and development of pests and diseases.

The joint-stockholder subdivision Agropromkhiymiya, the agricultural posts for chemicalization, and soil fertility teams are involved with the agrochemical production service. They are distributed in a branched warehouse network which provides one-time storage of 9 million metric tons of mineral fertilizers and 60,000 metric tons of pesticides. More than 30 million metric tons of mineral fertilizers (in physical weight), 40 million metric tons of lime, and 500 million metric tons of organic fertilizers have been processed and applied to the soil on the average per year from 1986-1990 by the agrochemical subdivisions.

Under conditions of a severe budget deficit, the ministry has successfully retained the agrochemical service and the plant protection service. Due to agrochemical monitoring we know the state of soil fertility and effectiveness of the use of chemicalization today in all regions of Russia. In 1994 the negative balance of nutrient elements in the soil reached 100 kg/ha of plowed land. This means that 80-90 percent of the harvest was obtained by means of the potential fertility of soils and as the result of fertilizers applied in the past. At present soils are degraded because for four years in succession loss of nutrients has exceeded their input from mineral and organic fertilizers by a factor of 2-3.

The agrochemical service has carried out soil and agricultural production research everywhere on nitrate content. It has been established that in 1993-1994 the deficit of nitrate nitrogen comprised 40-60 kg/ha of plowed field. This is a threat to the potential of the harvest, which can be rectified only by the application of fertilizers.

The second problem is related to the deficiency of nutrient elements, the enhancement of soil acidity, and the increase in the mobility of heavy metals and radionuclides; this leads to their accumulation in plants. And because of this, there is a threat to the health of animals and human beings.

In 1994 the agricultural manufacturers could turn out only 1.3 million metric tons, i.e. in all, 10 kg per hectare of plowed land, of the 9.3 million metric tons of mineral fertilizers requested (d.v.) [expansion not given]. The use of fertilizers was curtailed by a factor of 10 compared to the average annual level achieved

in 1986-1990. According to an expert estimate, because of this, the agricultural industry was short 35-40 million metric tons of production; this, when converted to grain, includes 20 million metric tons of grain.

A negative balance of nutrients has built up: their loss from the soil from the harvest and weeds has exceeded the input of mineral and organic fertilizers by a factor of three. In estimating their losses of nutrient elements, it is sufficient to say that it is necessary to apply 70 kg of NPK to obtain 1 metric ton of grain. The soil degradation process may become irreversible, and the yield will revert to the natural fertility level — 10-12 centners/hectare.

The volume of plant protection have also been sharply reduced. Some farms have completely stopped using herbicides, fungicides, and insecticides; the fields are overgrown with weeds, and infection of seeds with dangerous diseases has increased. It is even worse with fumigation. Retardants are almost not used, and this leads to lodging of grain, large expenditures during harvesting, and crop losses.

The use of chemical feed additives and preservatives has declined manyfold. As the result, the quality of the grains laid in has worsened, and their phosphorus deficiency has reached 30-35 percent.

Not having a demand for their production, the domestic chemical enterprises use only 30-40 percent of their production capacities, and this is because of the shipment of fertilizers from abroad. Warehouses along railroad lines and subsurface warehouses are in a condition to receive 9 million metric tons of mineral fertilizers for winter storage. But they are empty and in ruins, and some of them are used for an unintended purpose. The economy is clearly antimarket: we export fertilizers and import feed products.

The basic reason is the disturbance of price parity for chemical and agricultural production. The result is that it has become unprofitable to use fertilizers and obtain a large harvest.

The situation is becoming catastrophic also with the provision of fertilizers for spring sowing in the current year. Less than a kilogram per hectare of them has been stored in Russia since autumn. Two-thirds of the oblasts have received no fertilizers at all, and the remainder, only certain farms.

The Russian Ministry of Agricultural Production together with the Russian Committee of the Petrochemical Industry and the Russian Agrochemical Service brought to the Government of the Russian Federation the project of the decree on the stimulation of the production and use of fertilizers. It provides for the distribution of specialized treasury obligations to pay for the mineral fertilizers and plant protection agents acquired by attract-

ing the financial resources of the federal and local budget, commercial banks, and foreign investors, and also crediting interseasonal reserves of chemical agents, the freezing of prices for gas and electrical energy, the establishment of preferential tariffs for railroad transport, etc.

The Russian Ministry of Economics and the Russian Ministry of Finance are studying the problem of the shipment of mineral fertilizers and plant protection agents in an analysis of the corresponding payments of taxes with subsequent payments to agricultural commodity producers with a budget according to the achievement of agricultural production with a reduction in the total payment by 50 percent. In this proposal, not only is there the payment of taxes in a natural form, but also the nonpercentage crediting of agriculture and an increase in compensation for expenses for acquiring chemicalization agents.

The restoration of an internal market for mineral fertilizers in many ways will depend on the amount of expenditures for their use. Chemical enterprises can lower the production cost of their products by means of more complete use of production capacities. For the purposes of maintaining a material-technical base of chemicalization in the village, we recommend that they participate in the joint-stock companies of the Agrochemical Service rayon associations, establish seasonal prices for mineral fertilizers and pesticides, and use the existing warehouse network for the village as reserve bases of production plants. Complex fertilizers are used in great demand both in Russia and abroad. Russian scientists have developed new brands of mineral fertilizers modified with microelements and sodium humate. In practice, container mixtures of fertilizers, pesticides, and plant growth regulators occupy a larger and larger place. Thus, the Science-Technical Council of the Russian Federation Ministry of Agricultural Production for the treatment of seed recommended the wide use of a new film-forming substance MiBAS containing microfertilizers.

Time does not wait. We appeal to the enterprises-suppliers with a request for the shipment of fertilizers and plant protection agents without preliminary payment for the reserve bases and railroad warehouses of the Agrochemical Service for domestic storage. This will make it possible to avoid last year's mistakes, when in April and May the chemical enterprises could not satisfy the rush demand, but in June-September put workers on unpaid leave.

All of us must understand that agriculture not only produces food products but also provides employment to millions of industrial workers in the chemical industry, machine building, raw material sectors, energy, and transport.

Biomethod Reduces Cotton Growing Costs

957A0632B Moscow ZASHCHITA RASTENIY
in Russian Mar 95 No 3, p 15

[Article by B. Dzharakulov, chief scientific associate of the Surkhandarinsk Branch of the Khopok Scientific Production Association: "Expenditures Have Been Reduced by a Factor of 20"]

[FBIS Translated Text] The harvest of raw cotton in the sovkhos imeni Akhunbabayev and also on many other farms of the Surkhandarinsk Oblast was not large before 1970 — 18-22 centners/hectare. In those years we also began to develop and introduce elements of intensive technology for cultivating the crop — methods of pretreatment of the soil before planting, auxiliary preplanting irrigation, and contour planting along ridges, etc. The techniques for plant protection were also improved on this background.

It is well known that in the 1960's there was support for the chemical method for combatting pests. Repeated chemical treatments of fields, however, produced a number of negative factors — environmental contamination and the death of useful insects. Agricultural engineering and biological methods of control were undervalued.

The situation began to change due to the implementation of technologies which are proposed. Auxiliary irrigation and planting along contours and ridges, for example, provoked the emergence of weeds and guaranteed the obtaining of early friendly aligned shoots. Wide-row plantings brought about an improvement in the microclimate, and this led to a substantial decrease in the pest population, a reduction in their harmfulness, and an improvement in the growth, development, and productivity of the cotton plant.

Adoption of the biomethod and the imposition of regular inspections of fields has played an even greater role. Previously for analysis we observed a single species of pests in the field, and we also made observations be-

fore and after each vegetational irrigation. The estimation of the actual thresholds of harmfulness became the basis of the new approach. Groups of inspectors were formed from a number of the agricultural personnel of the sovkhos and from observers, and they increased the observations for the development of pests; in 1974 a biological laboratory was organized, and since 1980 a biological factory has been functioning which is engaged in the propagation of elatoglazka, trichogramma, braconid wasps, and other entomophagous organisms, and this fulfills all the requirements for the protection not only of the cotton plant, but also other crops.

The results of the investigations were given to the staff organized by the chief agronomist of the sovkhos. This information was submitted in the form of a field card with the foci of infection inscribed on it. After a decision about the necessity for control, the cards were given to the appropriate teams. The advantage of the card method is that it is clear and is easily mastered. The agronomists of the departments and the sovkhos entomologist have supervised the course of the work. All the participants in the work are each issued three liters of milk and ten eggs per day, and work clothes; they are granted vouchers for medical treatment and free food. Valuable gifts — even automobiles — are given as bonuses to the most outstanding workers.

The investigative groups have held meetings once every 5-10 days, have defined the infected areas more precisely, and have decided what to do in one or another case.

Trichogramma, braconid wasps, and biological preparations — dendrobacillin and entobacterin — have become the main biological agents. Before 1984 in order to control the cotton moth, a single application of trichogramma was used in the egg laying period of each generation, and then the fields were sprinkled with biological preparations. The effectiveness of trichogramma comprised 40-65 percent, and of biological preparations, 75-80 percent.

Year	Processed						Harvest (cent/ha)
	Total		Including				
	Area (ha)	Shortage	Chemical Method		Biological Method		
			Area (ha)	Shortage	Area (ha)	Shortage	
1972	52,193	10.4	52,193	10.3	—	—	15.7
1976	38,965	8.8	38,290	8.5	675	0.1	26.6
1980	21,000	5.1	18,450	4.5	2,550	0.6	33.2
1984	5,850	1.4	—	—	5,850	1.4	35.0
1988	8,500	2.0	—	—	8,500	2.0	29.2
1992	3,350	1.0	—	—	3,350	1.0	32.5

Since 1984 we have been using only entomophagous organisms. We apply trichogramma (60,000-80,000 specimens per hectare) up to three times at a three-day interval. If necessary, braconid wasps at an average of 250-1000 specimens per hectare are used against older generation caterpillars. These measures have enabled 2-6 centners per hectare of cotton to be kept from being lost.

Against sucking pests (aphids, thrips, spider mites) we recommend the application of elatoglazka (100-150 individuals per hectare). Biological factory workers do this in the evening or in the morning. Such a control tactic makes it possible to retain the natural enemies of cottonfield pests, and subsequently eliminates the necessity for carrying out special measures.

In addition, chemical treatment, as a rule, is excluded.

The table gives a presentation of the results of work performed at the sovkhoz imeni Akhunbabayev. It is obvious that chemical treatment has been eliminated completely since 1984. Expenditures for the protection of the cotton plant have been reduced by a factor of 20 in comparable prices.

Symbiont-Universal, the Domestic Natural Immunoregulator

957A0632C Moscow ZASHCHITA RASTENIY
in Russian Mar 95 No 3, pp 34-36

[Article by I.F. Kuznetsova chief specialist, Agros Too
(Expansion not given)]

[FBIS Translated Text] Resources for increasing the productivity of agricultural crops are far from exhausted, and the means for chemicalization of agriculture, as before, remain one of the key factors providing high plant productivity. However, it is possible to obtain a maximal increment in the harvest of an ecologically clean product only with biological methods for treating plants and the soil.

One of these methods is based on the natural ability of cultured plants to develop in symbiosis with mycorrhiza fungi. This symbiosis is beneficial. The fungi, which establish themselves in the roots and use them as a source of food and energy, in their turn synthesize many biologically active substances necessary for normal plant growth and development — hormones, amino acids, enzymes, pigments, lipids, and vitamins.

Plants with a well-developed mycorrhiza assimilate atmospheric nitrogen and soil phosphorus from difficultly soluble compounds, and they are more productive and resistant to pathogens and pests. It was established that all the new high-yield varieties of domestic selection are not inferior, but often even surpass in mycotrophy the

perennial wild cereals. The reason for the weakening of the activity of endophytic fungi in annual agricultural crops ordinarily is the reduction in their productivity from improper agricultural technique.

Is it possible to raise the microtrophism of plants? Yes, it is possible. And the symbiont-universal — the first domestic natural immunoregulator which is isolated from the roots of the highly mycotrophic medicinal plant, the ginseng — easily copes with this task.

Information About the Preparation

The symbiont-universal is an alcoholic extract of the products of metabolism of the lower fungi of endophytes, which have a stimulating effect on the composition with other useful microorganisms (bacteria and yeasts).

It activates the development of the endotrophic mycorrhiza of plants, the synthesis products of which are necessary in order to produce the harvest and increase immunity to diseases and pests. The endophytic fungus is cultivated on an especially selected artificial nutrient medium, and an ethyl alcohol solution (55-60°) is used as the solvent, due to which the activity of the preparation is maintained at room temperature for several years.

What is the reason for the effectiveness of the preparation? What is the mechanism of its effect?

The reason is the exceptionally high physiological-biological activity of the preparation, which contains a unique complex of biologically active substances (hormones, amino acids, enzymes, vitamins, pigments, lipids, etc.)

The treated seeds sprout more rapidly and produce plants with a sturdier root system. The hormonal effect of the symbiont on plants at the beginning of their development is like a long-lasting chain reaction: photosynthesis improves, and, consequently, also the conditions for nutrition of the symbiont fungi, which actively supply plants with their synthesis products.

Method of Use and Standard of Consumption

The preparation is used both for preplanting treatment of seeds and also for spraying of vegetating plants.

The standard of consumption is 1 ml/metric ton or 200-200 L/ha.

Results of Production Tests

The symbiont-universal has undergone wide production testing in different soil-climatic zones (in 1988-1990 more than 300 experiments were conducted over a total area of more than 50,000 hectares) on many crops:

grain, legumes, vegetables, potatoes, sugar beets, cotton plants, fruit, and berries. The preparation was used both separately or in combination with chemical plant protection agents.

The Symbiont-Universal Provided on All Plants:

- A stable increase in the harvest (more than 20 percent) and its earlier (by 7-8 days) maturation due to an increase in the growth of the root system (by a factor of 2 or 3) and the area of the leaf surface (by 15-20 percent);
- A reduction in the sensitivity of plants to disease;
- An increase in drought and frost resistance;
- High quality of plant material and of the products obtained (a decrease in the amount of nitrate, nitrites, and radionuclides).

Since 1992 specialists of the firm Agroc have introduced the use of the symbiont-universal on grain crops in a number of Russian oblasts. The results are encouraging. Thus, in the Obolenskiy Sovkhoz of the Kurskiy Oblast, when winter wheat seed were treated in the vegetation period, the yield rose by more than 10 cent/ha. In the Pravda and Sadovod sovkhozes of the Makushinskiy Rayon of the Kurganskiy Oblast, preplanting treatment of spring wheat seeds provided an additional yield on a level of 4.5-5.4 cent/ha. In the Zavety Ilyicha Kolkhoz of the Kochubeyevskiy Rayon of the Stavropol Kray, the yield of winter wheat treated with the symbiont over an area of 1260 hectares was 2.6 cent/ha more than on the control tract.

The effect of the immunoregulator on spring barley on farms of the Rostovskiy Oblast was that in the drought of 1994, the Kadamovskiy Sovkhoz of the Shakhvinskiy Rayon over an area of more than 700 hectares (treatment of vegetating plants) had an increase in yield of 1.5-3 cent/ha, and the Ostrovskoye KSP [expansion not given] of the Aksayskiy Rayon over an area of 300 hectares (treated with seeds) had an increase of 3.6 cent/ha. And there are many such examples.

In 1994 in order to develop the technology for using the preparation, it was studied additionally in field and production experiments at scientific institutions for a wide variety of crops:

the All-Russian Research Institute for the Selection and Seed-Growing of Vegetable Crops (open fields) — cucumbers, large onions, cabbage, and carrots;

the All-Russian Research Institute for Vegetable Production (protected fields) — cucumbers, peppers, eggplant, radishes, and Chinese cabbage;

the All-Russian Research Institute for Plant Protection (Ramon) — sugar beets;

the All-Russian Research Institute for Leguminous and Groat Crops (Orel) — peas, buckwheat, and millet;

the All-Russian Selection-Technology Institute for Horticulture and Fruit Growing — fruit and berry crops (strawberries, black currants, vines, gooseberries, cherry trees, and apple trees);

The effectiveness of the preparation was established and confirmed by the treatment of seeds, tubers, vegetating plants, seedlings, and grafts of fruit and berry crops, and also of cucumbers and other vegetable crops on protected and open fields.

The results of the tests conducted enable the following advantages of the biological preparation to be noted:

- a wide spectrum of effects; a composition with microelements (copper sulfate, iron, boron, molybdenum, etc.) guarantees an increase in the yield and augments resistance to unfavorable factors both on open and protected fields;
- ecological cleanness of the preparation provided by its natural origin, composition, and exceptionally low doses;
- its use is incorporated in existing technologies and does not require extra precautionary measures or special agents and mechanisms;
- the preparation does not produce mutagenic effects;
- it increases the uniformity of seeds, activates photosynthesis processes, contributes to the emergence of compatible sprouts and of the growth and development of the root system, the formation of generative structures and foliage, better root formation of seedlings and grafts, a reduction in the periods of vegetation, and the obtaining of an earlier harvest;
- an increase in the immunity of plants to diseases and pests, and also resistance to the effect of low temperatures and other stress factors;
- when necessary, it can be used simultaneously with pesticides for the treatment of seeds and plants at an early stage of their vegetation

The preparation is produced in hermetically sealed glass or polyethylene ampoules having a capacity of 1 ml or capacities from 100 to 500 ml.

Contracts for the use of symbiont-universal are offered by specialists of the Agros firm according to the following conditions.

The preparation is made available to a farm at no cost. An addition to the harvest of 0.5-1 cent/ha will be accepted as the basis of mutual expenditures. In this case, 30 or 50 percent of the revenue (according to the contract agreement) remains with the farm, and of the 70 or 50 percent of the funds due to Agros, half is designated for the staff members of the temporary creative collective.

To all who are interested in the symbiont-universal and wish to test the effect of the immunoregular on their own farm or in their own rayon, Agros TOO guarantees that only positive results will be obtained for grain, leguminous, vegetable, technical, fruit, and berry crops.

Our address: 101000, Moscow, Main Post Office, Box 802. Telephone 207-21-20, 207-28-75.

Genetic Monitoring of Population Residing in Region of Semipalatinsk Nuclear Test Site

957A0729A *Almaty ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian Mar 95*
No 3, (signed to press 27 Feb 95) pp 18-21

[Article by Ye. U. Kuandykov, R. K. Tulebayev, G. S. Svyatova, G. Zh. Abildinova, and T. I. Slazhneva, Shymkent Medical Institute, Republic Research Center for Mother and Child Health Care; UDC 616-056.7(574)+575.191]

[FBIS Translated Text] **Abstract.** The incidence of congenital developmental defects was checked for the purpose of studying genetic monitoring of inhabitants of the region near the Semipalatinsk nuclear test site. A survey of 21,600 people residing in this region revealed 7.35 people with congenital pathology per 1,000 population. References 4.

Key words: genetic monitoring of population, incidence of developmental defects, effect of radiation on heredity.

The methodological and technical guidelines applied to this study are based on approaches used at the Medicogenetic Research Center of the Russian Academy of Medical Sciences (Moscow), and Research Institute of Hereditary and Congenital Diseases of the Belarus Ministry of Health (Minsk).

The concept of genetic burden includes an extensive group of pathological states that diminish population adaptability by about 20 percent. In addition to hereditary diseases, it includes indicators of mortality (particularly perinatal and in infancy), disability, mental retardation, prenatal deaths, and others. In real life, assessment

and monitoring of the entire genetic burden of a population constitute an extremely difficult task by virtue of economic, methodological and other problems.

Of all the existing methods of genetic monitoring, monitoring of incidence of congenital developmental defects is the most suitable for our republic, for which reason this model was chosen for quantitative evaluation and forecasting mutation processes in populations under study.

A medicogenetic screening was carried out of the inhabitants of regions in the zone of extreme and maximum radiation risk in order to determine the possible genetic sequelae of exposure to many years of nuclear tests on the Semipalatinsk testing grounds. The study was carried out in four rayons of Semipalatinsk Oblast: Abayskiy, Zhanasemeyskiy, Beskaragayskiy, and Kokrektinskiy (control). We screened 21,641 people, 9400 of whom live in the zone of extreme radiation risk, 5946 in the zone of maximum risk, and 6295 in the zone of minimal risk.

A record was kept of cases of congenital developmental defects and hereditary disease, as well as undifferentiated mental retardation. Detection and subsequent medicogenetic screening of patients with genetically determined pathology were carried out on the basis of examination of the list of patients on the records of a rural district hospital and conversations with senior family members during a door to door survey.

In Pavlodarsk Oblast, studies were carried out in Lebyazhinskiy Rayon with a population of 27,190 people. The studies included 1983-1991 data from the records of the maternity ward of Lebyazhinskiy Central Rayon Hospital, lists of patients with hereditary and congenital pathology tabulated by means of a specially elaborated questionnaire. Patients were picked up through physicians of central rayon hospitals, SUB, SVA [expansions unknown], and feldshers of feldsher-midwife centers in order to increase the probability of determining recorded genetic pathology and to improve the reliability of estimates of its incidence in the population.

In the urban centers studied in Semipalatinsk Oblast we found 159 patients with recordable pathology, which constituted 7.35/1000 population. Among chromosomal pathology, Down's Syndrome was found in 11 people, 1 of whom had expired by the time of the survey. In the remaining 10 cases, the clinical diagnosis was confirmed by personal examination and testing. Analysis of annual births failed to reveal reliable differences. In more than half the cases (6) the mothers of the subjects were over 38 years of age, which could have been the cause of the observed disease. In the zone of extreme radiation risk,

the incidence of Down's Syndrome constituted 0.60/1000. We failed to demonstrate reliable differences in incidence of this disease among rayon residents as a function of zone of radiation risk.

Monogenetic diseases were diagnosed in 30 people (1.39/1000). The figures were 2.98 (28) in the zone of extreme radiation risk, 0.16 (1) in the one with maximum risk, and 0.66 (1) per 1000 population in the one with minimal risk, i.e., there was a reliable accumulation of this type of pathology in the zone of extreme radiation risk. At the same time, it should be noted that the indicator for incidence of monogenetic diseases, including dominant ones (0.98/1000) did not differ in zones of extreme and maximum radiation risk from analogous indicators for republics of Central Asia [2].

In regions included in the zone of extreme radiation risk, the incidence of undifferentiated mental retardation constituted 2.34/1000 population, and it did not differ reliably from analogous data for the zone of maximum radiation risk — 2.02/1000.

Thus, in urban centers in the zone of extreme radiation risk we found 100 patients with relevant pathology, which constituted 10.06/1000. The highest indicators were noted in Bodene, Cheremushki, Mostik, and Dolon in Beskaragayskiy Rayon — 12.85/1000 population. In regions with minimal radiation risk this indicator constituted 2.86, and it was reliably lower than in regions of extreme and maximum genetic risk.

We studied the retrospective incidence and structure of congenital developmental defects (CDD) among neonates in Semipalatinsk, which is in the zone of increased radiation risk, in order to determine the possible mutagenic effect of radiation. We analyzed 64,142 histories of birth and development of neonates in 1980-1988. The incidence of CDD constituted 13.3 from 1980 to 1984 and 16.3/1000 neonates in 1985-1988, i.e., there was a reliable rise. This happened because of rise in incidence of developmental defects of the central nervous system, respiratory and genitourinary systems, and developmental defects of the skin. At the same time, we found a reliable decline in incidence of facial defects. The observed rise in developmental defects could be a reflection of random fluctuations of their incidence or related to differences in identifying different forms. For this reason, we assessed the incidence of so-called "model" forms of CDD. These defects are manifested right at the time of birth and diagnosed in the same way regardless of qualifications of the physician. They include defects of the neural tube, reduction defects, facial clefts, etc.

The incidence of "model" forms constituted 5.73/1000 population in 1980-1984, and 5.35 in 1985-1988, i.e., we failed to demonstrate reliable rise in incidence of "model forms" of CDD from 1980 to 1988. It should be noted that the incidence of "model" CDD in Semipalatinsk was even somewhat lower than for Almaty, where it constituted 6.36/1000 in 1985-1988. At the present time it is difficult to judge the extent to which the observed differences in overall incidence, particularly in incidence of "model forms" of CDD, in different populations reflect actual interregional differences or detection and registering errors. One thing is certain: these data can be used as tentative figures in planning future studies to monitor the intensity of the mutation process in the future.

As shown by studies of children in the region of the Chernobyl Nuclear Power Plant, birth weight may be one of the biological indicators of effect of the radiation factor on health of the population.

For this reason, it was interesting to study this parameter among children in Lebyazhinskiy Rayon. We analyzed the records of the maternity department of Lebyazhinskiy Central Rayon Hospital. Records from 1983 on were available for our study. In all, we analyzed 1104 neonate charts, including 709 for 1985-1986 and 395 for 1990.

Average weight of neonates in the population studied reflects general patterns of distribution of weight according to birth order (first born weigh less than subsequent infants) and sex (birth weight is lower for girls than boys). A comparison of dynamics of birth weight revealed that it declined in 1990, as compared to 1985-1986 (with the exception of boys who were not first-born). It was then interesting to compare the neonate weight indicators in the population studied and in Almaty. The results were similar, and weight differences ranged from 40 to 140 g. The higher birth weight in Almaty is most probably attributable to better socioeconomic living conditions in urban populations, as compared to rural ones. The findings revealed that, at the present time, the weight of newborn girls in the population adjacent to the testing grounds did not differ appreciably from the weight of infants in other populations of the republic. Evidently, only the acute effect of ionizing radiation could lead to change in this indicator. Since there are no data for the initial stage of exposure to the radiation factor for the population under study (1950s-1960s), it was impossible to verify this assumption.

Mental illness (schizophrenia, epilepsy), hereditary diseases (infantile cerebral paralysis), as well as duplication of patient lists obtained from different courses

(data of physicians of the Central Rayon Hospital, SUB and SV/A, feldshers of feldsher-midwife centers), were ruled out in the analysis of the data for Lebyazhinskiy Rayon. Retrospective incidence of CDD in Lebyazhinskiy Rayon (up to 90 percent of all infants are born in the maternity department of the Central Rayon Hospital) constituted about 9.0/1000 births, which is less than half the mean incidence of CDD among urban populations of Kazakhstan (22.90) about two-thirds of the latter in Pavlodar — 14.2/1000 births (our own findings).

The differences in incidence in different years were substantial, ranging from 4.5/1000 births in 1985 to 13.5 in 1988. Most probably, the demonstrated differences were related to differences in diagnosing and registering different forms of CDD, which we subsequently demonstrated in a study of urban populations. We then analyzed the incidence of different forms of CDD that could be identified objectively.

The incidence of so-called "model forms" of CDD constituted 6.0/1000 births. A comparison of these findings to the estimates for urban populations of Kazakhstan revealed a higher incidence (by 1.5-2 times) of spinal cord herniation and facial clefts, low incidence of Down's syndrome and similar estimates of incidence of polydactyly, reduction defects of the extremities and anal atresia. Multiple developmental defects were not diagnosed or registered at the maternity home. The demonstrated differences could be related to number of both objective and subjective causes which, perhaps, we will be able to determine in the course of future in-depth study of families of probands.

The incidence of other developmental defects, in particular, microcephaly, constituted 0.37, CDD — 1.62, and hydrocephaly — 0.36/100 births, which coincides with estimates for urban populations of Kazakhstan.

Thus, one can use some so-called "model" forms of CDD for genetic monitoring of populations adjacent to the Semipalatinsk Nuclear Testing Grounds [1, 4].

The genetic burden of recorded hereditary and congenital pathology constituted 15.48/1000 population in Lebyazhinskiy Rayon, which was 1.5 times greater than analogous data for regions adjacent to the testing grounds. The incidence of mental retardation was four times higher in Lebyazhinskiy Rayon than in Semipalatinsk Oblast, whereas the incidence of congenital developmental defects was 1.4 times higher.

It can be assumed that the findings for Lebyazhinskiy Rayon were similar to real assessments, since the study in Semipalatinsk Oblast was carried out by a team of medical geneticists working in different rayons. One could not rule out the probability of a subjective

approach to detection and registration of different forms of congenital and hereditary pathology. On the other hand, the time factor could have had an effect on the results of the study. As a rule, the study of inhabitants of one rayon in Semipalatinsk Oblast was limited to 5-10 days which very probably led to failure to pick up some of the pathology.

The estimate of incidence of dominant autosome pathology was comparable to data from population studies in Central Asia and the European part of Russia [3]. The incidence of recessive autosome diseases constituted 1.80/1000 population. This group included families in which two or more siblings were stricken.

This approach may not be entirely correct, since the infants' diseases could have been related not only to genetic, but also environmental factors (parents' bad habits, pathology of pregnancy and others). The causes could be established more precisely only through an in-depth clinical genetic survey of families of probands.

Mental retardation was the predominant form of pathology (more than 90 percent). Three or more stricken individuals were found in three families, which is reliably indicative of recessive autosome type of inheritance. There was a total of 10 cases, or 0.36/1000 population. Including 2 children with microcephaly, whom we screened, our estimate of incidence was 0.44/1000 population. It can be considered the minimal incidence of recessive autosome pathology in Lebyazhinskiy Rayon. Evidently, the true figure is in the range of 0.44-1.80.

On the whole, genetic epidemiological studies in regions adjacent to the Semipalatinsk nuclear testing grounds revealed the following:

1. The incidence of monogenetic diseases (dominant-autosome and recessive-autosome) in populations exposed to radiation did not differ appreciably from their incidence in other populations. Analogous findings were made with regard to the incidence of congenital developmental defects and birth weight.
2. The incidence of mental retardation of undetermined etiology was about four times higher in Pavlodar Oblast than in Semipalatinsk Oblast. The reasons for such great differences have not been determined.

Thus, records of hereditary diseases in a population, no matter how accurate they are, without other studies do not permit evaluation of their dynamics because the incidence of pathology is affected by a number of causes: failure to pick up some CDD, random fluctuations thereof, as well as interregional differences due to genetic-demographic, socioeconomic and other factors which we virtually failed to take into consideration in our study. For this reason, it is not deemed feasible to

draw definite conclusions as to the assumed effect of radiation on the genetic burden of populations surveyed.

The combined efforts of ecologists, hygienists, and epidemiologists will be required to solve this problem, in order to elaborate and make use of a system of long-term genetic monitoring for timely registration of the mutagenic effect of environmental factors on human heredity, and specialists in population, medical and demographic genetics must play the deciding role.

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Use of Questionnaires as an Additional Factor in the Study of Health Status of Aral Region Residents
957A0729B *Almary ZDRAVOOKHRANENIYE KAZAKHSTANA in Russian* Mar 95
No 3, (signed to press 27 Feb 95) pp 21-23

[Article by P. P. Petrov and T. K. Kalzhekov, Research Institute of Hygiene and Occupational Pathology of Kazakhstan Ministry of Health, under the rubric "Ecology and Health"; UDC 614.2(079.5)]

[FBIS Translated Text] **Abstract.** A sociological study was carried out of health status of Kazalinskiy and Zhanakorganskiy rayons of Kzyl-Orda Oblast, which are in an ecologically adverse zone. It was established that with worsening of environmental factors there was also worsening of living conditions, which affected the health of 96 percent of the population.

Key words: Aral Region ecology, health status of Aral Region residents.

The health status of the population as a whole and of different groups thereof is related to the influence of

environmental and socioeconomic factors, and industrial situations, as well as capacities of health care agencies and institutions with respect to health protection. This applies in particular to the Aral Region. We carried out a broad-scale sociological study of the health status of a representative group of residents of Kazalinskiy (zone of ecological disaster) and Zhanakorganskiy (zone of ecological crisis) rayons of Kzyl-Orda Oblast using special questionnaires. They were distributed among part of the inhabitants of Kazalinsk, the Kzylkumskiy sovkhoz in Kazalinskiy Rayon and Zhanakorgan, which is an urban type of settlement.

Most of those who filled out the questionnaires were in the group of residents 30-39, 20-29 and 40-49 years old. Among those questioned, 44.7 percent were males and 55.3 percent females. In this group, 42.2 percent had secondary specialized education, 31.5 percent — secondary, and 19.3 percent — higher education. About 70 percent of the population here consists of white-collar workers, and machine operators are in second place. They are followed by fishery workers. Of the respondents, 92.9 percent receive their wages with delay. This applied to 41.5 percent of the residents of Zhanakorgan. Employees of the Kzylkumskiy sovkhoz constituted 31.8 percent and those residing in Kazalinsk — 26.8 percent. As a rule, white collar workers did not have additional sources of financial aid.

The financial situation of most of the population of the Aral Region changed for the worse. About 3 percent of the respondents reported either considerable or some improvement of their lives. There was some worsening for 53.2 percent, and considerable worsening for 42.9 percent. The financial situation worsened by more than 40 percent for residents of Zhanakorgan residents, by 31 percent in the village of Kaukey (Kzylkumskiy sovkhoz), and by 27 percent in Kazalinsk.

The changed ecological situation in the Aral Region created conditions for increase in migratory processes in different rayons. Some of the population moved to other regions. Housing and employment are concepts that underwent radical change. This part of the questionnaire revealed maximum activity of respondents. Only 0.9 percent of those who filled it out reported that they are satisfied with their housing. Lack of municipal services was noted as the main flaw by 76.8 percent, crowded conditions by 10.6 percent, dampness and cold by 9.1 percent, and poor equipment by 2.7 percent. The share of housing problems mentioned in by respondents was about the same for all populated areas. Lack of hot and cold water was noted by 23.5 percent of Zhanakorgan residents, 26.5 percent by those of Kaukey, and 25.4 percent by those in Kazalinsk. Crowded housing was the complaint of 12.5 percent of those in Zhanakorgan,

and 8.7 percent in Kaukey. Poor lighting was mentioned in 4.0 percent of the answers from Kazalinsk, while dampness and cold were noted in 9.6 percent of answers from the village of Kaukey.

In 58.4 percent of the cases, people had separate housing or apartment. But this did not mean they were satisfied. As a result, 13.6 percent intended to build, 5.0 percent intended to acquire their own homes, and 11.5 percent signed up on a list for apartments. More than one-third of the respondents were unable to answer this question, since they did not see any realistic way to improve their housing conditions (36.5 percent for Kazalinsk, 33.3 percent for Kaukey, and 34.6 percent for Zhanakorgan). Most of these respondents were white collar workers, machine operators and sovkhos workers.

We obtained information about the influence of existing housing conditions on the health of the group under study. Most answers came from residents of Zhanakorgan (48.9 percent), Kaukey (29.3 percent) and Kazalinsk (20.9 percent). In only 16.0 percent of the cases did the respondents believe that their present housing did not affect their health. However, 28.5 percent stated that existing housing conditions are stressful, 20.9 percent reported frequent colds, 14.8 percent — exacerbation of chronic diseases, and 11.4 percent — deterioration of vision.

It is also rather interesting that, in the opinion of 32.5 percent of the Kzylkumskiy sovkhos residents, there is no relationship between housing conditions and health. However, in 25.6 percent of the cases, poor housing did cause stress, it led to colds in 16.9 percent of the cases, and exacerbation of chronic diseases in 9.1 percent.

The change in ecological situation in the Aral Region had a strong influence on the diet of local residents. Only 11.7 percent responded that it did not worsen, whereas 85.3 percent reported that it did worsen. Of this number, 15.6 percent assessed the diet as good at the present time, 55.3 percent considered it satisfactory, and 31.9 percent — unsatisfactory. Moreover, almost 40 percent of Zhanakorgan residents state that the diet is poorer.

The situation is no better at the Kzylkumskiy sovkhos. Most responses indicated a shortage of fruit, vegetables (27.8 percent), and poor quality of food (20.3 percent). There are many starch foods (18.5 percent), and meals are irregular (15.1 percent). There is a shortage of dairy products (14.3 percent). Lack of fruit, vegetables and dairy products was indicated by 38.7 percent of Zhanakorgan residents, 32 percent of those in the Kzylkumskiy sovkhos, and 29.2 percent in Kazalinsk. From the social aspect, the diet worsened most for white collar workers (74.6 percent of the responses), machine

operators (15.4 percent) and workers (10 percent) at the Kzylkumskiy sovkhos.

The change in quality of the diet among residents of the Aral Region affected their health. Only 14.4 percent did not complain of changes in digestive functions. One-third of the respondents reported constant unpleasant sensations in the gastric region, and 16.2 percent developed new diseases. There was a particularly large share of Zhanakorgan residents who reported unpleasant sensations in the gastric region, development of new and exacerbation of existing chronic diseases of digestive organs, and allergic reactions to some foods.

Most of the respondents (40.7 percent) believed that a reduction in all sorts of family expenses would help solve the difficult socioeconomic situation, 17.7 percent skimp on nutrition, 13.9 percent sell their belongings. Almost one-third of the respondents do not see a way to resolve their problems. As a result, more than half the respondents who do not have any other sources of income, continue to rely on their wages. Some of the population is looking for work that would pay more, 14 percent continue to live on their reserves and savings, 16.6 percent want to find additional work.

These studies revealed the consequences of the altered ecological situation and its impact on the social, medical and economic condition of the residents of the Aral Region. They are particularly worried about the rise in prices along with their low wages, and food shortage (84.7 percent of the responses). As a result, there is worsening of health in the presence of stress, people lose their jobs, and change their place of residence. It is not by chance that in 1993 the number of new cases of disability rose in Kzyl-Orda Oblast, as compared to 1992, particularly because of diseases of the nervous system, sense organs, and mental disorders.

Of those who responded, 71.6 percent complained of their health, 59.4 percent believe that they have a chronic disease. Only one-fourth of the population presented no complaints. About 30 percent denied having any chronic disease.

We must dwell on the responses that reveal the cause of chronic diseases. Quality of nutrition is put in first place by 19.5 percent of the respondents, working conditions by 18 percent, severe emotional experiences by 15.4 percent, and ecological changes in the region by 13.5 percent. This included the sequelae of prior acute diseases, difficult conditions in childhood, housing factors, lack of adequate medical care, smoking, consumption of alcoholic beverages. In such a situation none of the respondents considered themselves to be in excellent health. Only 8.2 percent considered it good, 45.7 percent satisfactory, and 12.2 percent poor. The largest

share of respondents who considered themselves to be in poor health was found among residents of Kazalinsk.

We obtained information about the steps taken by the public to preserve and strengthen health. One-third of the respondents went to see a physician at the first signs of illness. This indicator constituted only 25 percent for residents of Zhanakorgan, 38 percent in Kazalinsk, and 41.3 percent in Kaukey.

What is the public's attitude toward recommendations of health care providers? It trusts them and always follows their orders in 40.6 percent of the cases, 33.5 percent trust them but do not always follow recommendations, 19.3 percent do not trust them but follow their advice, and 6.6 percent neither trust them nor follow their advice.

Accessibility of medical care is one of the important factors that form the health of the people. Kazalinsk residents, for example, seek such care at a municipal polyclinic, and the Central Rayon Hospital, which is 8 km from the oblast center. The residents of Zhanakorgan are serviced by a central rayon hospital and those of the village of Kaukey by a district hospital.

We found that 30 percent of the residents of Kazalinsk are quite satisfied with medical care, 44 percent would like to go to the medical and preventive care institutions of Almaty, 16 percent require highly qualified physicians. The results are different for Zhanakorgan. There, one-third of the population is quite satisfied with the medical care received at the Central Rayon Hospital. However, 27.4 percent need more qualified care, and 22.6 percent expressed the desire to have consultations with specialists in Kzyl-Orda and Almaty. In Kaukey, 35 percent are quite satisfied with medical care at the district hospital, 42.8 percent would like to be treated at the oblast center and in the capital, 11.1 percent expressed the wish to have more qualified care in their village.

Now a few words about accessibility of medical care discussed by respondents. About 60 percent wrote that they receive medical care free of charge and at any time of day (34 percent in Kazalinsk, 60.7 percent in Zhanakorgan, 76.2 percent in Kaukey). One-fifth of the responds reported that time off and personal financial outlays were needed to obtain medical care. This indicator is particularly high for Kazalinsk (38 percent). More than 8 percent even indicated that it was necessary to pay for any type of medical services.

Finally, the last item in the questionnaire. It pertained to supply of medication. Only 7.1 percent reported that availability was excellent, 46.2 percent — satisfactory, and 35 percent — poor.

Thus, it was deemed possible to analyze extensive material as a result of using questionnaires to interrogate part of the residents of Kazalinsk, Kaukey (Kzylkumskiy sovkhov), and Zhanakorgan. It characterizes the sociomedical and economic aspects that pertain to those residing legally in the rayons studied. The answers to the questionnaires will make it possible to outline realistic means of eliminating some of the negative consequences of the Aral disaster, which resulted in a set of negative changes in the life, activities and health of those living in the Aral Region.

Isolation and Study of Some Properties of Bovine Aorta Caldesmon

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Mar 95 Vol 60 No 3, (manuscript received
30 Sep 94; after revision 10 Nov 94) pp 339-348

[Article by L. K. Skolysheva, Ye. A. Smirnova, M. V. Medvedeva, N. B. Gusev, Department of Biochemistry, Biology Department Lomonosov Moscow State University; UDC 577.353.2]

[FBIS Abstract] Caldesmon is a common actin- and calmodulin-binding protein found in most smooth muscle and many nonmuscle cells. Caldesmon is involved in the regulation of the contraction of smooth muscles. It is also important in the formation of an actin cytoskeleton in nonmuscle cells. Phenotypical modulation of smooth muscle cells is accompanied by changes in the isoform content of caldesmon similar to the changes which occur in atherosclerotic vessel damage. A method is developed to isolate caldesmon from a bovine aorta. Care must be taken to isolate the caldesmon from accompanying connective tissue proteins with a similar molecular weight. This can be accomplished by sequential anion (Q-Sepharose) and cation (phosphocellulose) exchange chromatography. The caldesmon derived from bovine aorta is found to be very similar to caldesmon extracted from birds and other animals. Differences occur in the N-end peptides. Substantial differences reported by other authors are attributed to inadequate purification methods. Figures 4; references 26: 2 Russian, 24 Western.

Natural and Recombinant Isoforms of the Nuclease *Serratia Marcescens*. Comparison of Characteristics With Plasma-Desorption Mass Spectrometry

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25 Apr 94; after revision 17 Sep 94) pp 450-461

[Article by Yu. Pedersen, M. Filimonova, P. Roepstorff, K. Biederman, Department of Biotechnology, Technical University of Denmark, Lyngby, Denmark; Department of Microbiology, Kazan State University; Department of Molecular Biology, Odense University, Denmark; UDC 577.152.3]

[FBIS Abstract] This article presents a complete characterization of isoforms of enzymes isolated from the nuclease *S. marcescens* B10M1. This information is used to identify partially characterized isoforms of recombinant nuclease *S. marcescens* W225. Plasma-desorption mass spectrometry is used to characterize the primary structure of isoforms of natural nuclease secreted by *S. marcescens* and recombinant nuclease produced by *E. coli*. The isoform separation procedure is described. A new isoform, Sm3, was detected among the naturally secreted nuclease isoforms. The isoform differs from Sm1 and Sm3 at the N-end. Natural nucleases SM1 and Sm2 and recombinant isoforms rSM1 and rSm2 are shown to be identical. Figures 5; table 1; references 16; 5 Russian, 11 Western.

Modulation of the Defensive Reaction of Cotton Plants Under Stress in Response to the Effect of Possible Elicitors of β -1.3;1.6-Glucan Origin

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3 Jun 94; after revision 5 Oct 94) pp 470-477

[Article by N. I. Shirokova, Zh. A. Abdurakhmanova, Sh. I. Salikhov, L. A. Yelyakov, Pacific Institute of Bio-Organic Chemistry, Far East Division, Russian Academy of Sciences, Vladivostok, Institute of Bio-Organic Chemistry, Academy of Sciences of the Republic of Uzbekistan, Tashkent; UDC 577.154]

[FBIS Abstract] The effect of β -1.3;1.6-glucans in stimulating a defensive reaction in cotton plants under the stress of heat shock and wilt infection is studied. The defensive effect was determined by the increase in the level of β -1.3-glucanase and protein kinase C. It is found that β -1.3;1.6-glucans are possible elicitors. Three-day-old cotton shoots had a factor of two increase in the activity of β -1.3-glucanase. The response of twenty-week-old shoots was more pronounced in the roots than the leaves. The glucans were obtained in enzymatic transformation of laminarin by endo- β -1.3-glucanase from a mollusk and a potato. The differing responses

of low and medium molecular weight glucans from the mollusk and the potato glucan are analyzed. The effect of the presence of a protein kinase activator is described. Tables 6; references 24: 8 Russian, 14 Western.

Optimizing Protocol for Solid-Phase Automatic Peptide Synthesis Using a Variable-Volume Continuous Reactor

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KHIMIYA in Russian Mar 95
Vol 21 No 3, pp 179-187

[Article by S.A. Moshnikov, L.G. Mustayeva, A.V. Danilov, I.Ye. Sukhov, and M.B. Baru, Pushchino Affiliate, Bioorganic Chemistry Institute imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Pushchino, and Bioorganic Chemistry Institute imeni M.M. Shemyakin and Yu.A. Ovchinnikov, Russian Academy of Sciences, Moscow; manuscript received 16 Mar 94; UDC 577.112.6:542.953]

[FBIS Abstract] A protocol was developed for the solid-phase synthesis of peptides in MilliGen/biosearch 9500 and 9600 automatic synthesizers. The synthesizers' hydraulics were modified. Specifically, the intermittent reactors were replaced with built-in variable-volume continuous reactors, and the hydraulic circuit was modified to permit parallel peptidyl-polymer rinsing processes and activation of the amino acid derivative in the preactivator. In addition, the hydraulic circuit was made to consist of three basic loops: 1) a line of solvent and reagent tanks connected through an extra pump to the drive of the MMS (Czechoslovakia) series-produced pump, on which a special plunger membrane head is mounted that is connected to the variable-volume continuous reactor; 2) a line of activating reagents and solvent to rinse the preactivator's communicating lines through the line of amino acid tanks that passes through a proportioning pump and is connected to the preactivator; and 3) a system of valves to recirculate the solution from the preactivator through the variable-volume continuous reactor. Data from swellographic monitoring were used to optimize the synthesis process parameters. The newly developed protocol was used to synthesize peptides containing between 10 and 21 amino acid residues. The amounts of reagents and time required to synthesize four peptides (designated F1-F4) by the 9-fluorophenylmethyloxycarbonyl (Fmoc) strategy and one peptide (designated B1) by the *tert*-butyloxycarbonyl strategy in accordance with the modified protocol were compared with those required in the standard protocol. In many cases, the modified protocol only required half the amount of reagent required by the standard protocol, and in some cases, only one-sixth of the amount of reagent required with the standard

protocol was needed. The time required to produce the peptide B1 (with a purity of 80 percent in a 72 percent yield) was reduced from 48 hours 47 minutes to 36 hours 51 minutes. The modified protocol made it possible to synthesize the peptides F1-F4 with respective purities of 85, 65, 70, and 90 percent in respective yields of 68, 83, 82, and 66 percent. The modified protocol made it possible to synthesize the peptides F1-F4 in the following amounts of time: 15 hours 44 minutes (as opposed to 31 hours 12 minutes); 46 hours 10 minutes (as opposed to 60 hours 41 minutes); 53 hours 32 minutes (as opposed to 78 hours 11 minutes); and 37 hours 17 (as opposed to 40 hours 36 minutes). Figures 2, tables 7; references 13: 8 Russian, 5 Western.

Cleavage of Double-Strand DNA by Bleomycin Derivatives of Oligonucleotides Forming a Ternary Complex

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[Article by D.S. Sergeyev, T.S. Godovikova, and V.F. Sarytova, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, Russian Academy of Sciences, Novosibirsk; manuscript received 15 Feb 94; UDC 577.113.4:543.422.25]

[FBIS Abstract] A study examined the destruction of double-stranded DNA by bleomycin derivatives of oligonucleotides forming a ternary complex with the DNA. The study established that derivatives of hexadecathymidylate containing a covalently bound residue of the antitumorigenic antibiotic bleomycin A₁ is capable of forming a ternary complex with a double-stranded 30-element DNA target and effecting complementary addressed modification as part of the said complex. It was further established that a fivefold excess of the reagent in relation to the target results in nonspecific cleavage of mainly the pyrimidine-rich strand of the DNA target. The 5'- and 3'-bleomycin derivatives of hexadecathymidylate resulted in total cleavages of 25 and 35 percent respectively in the case of the purine-rich strand and 47 and 36 percent respectively in the case of the pyrimidine-rich strand. In contrast, the nonspecific cleavage induced by the 5'-bleomycin derivative of hexadecathymidylate not forming a ternary complex amounted to 6 percent in the case of the purine-rich strand and 16 percent in the case of the pyrimidine-rich strand. A comparison of the said total degree of cleavage and nonspecific cleavage confirmed the predominance of site-specific cleavage over nonspecific cleavage. The triplex formed by the 5'-bleomycin derivative of hexadecathymidylate with the DNA target was found to melt at a temperature of 40°C, which is 5°C degrees lower than the melting point of the analogous triplex formed by hexadecathymidylate. When the temperature

was decreased from 50 to 20°C, the degree of cleavage of the DNA target increased in accordance with the fractions of target molecules located in the ternary complex. Figures 5, table 1; references 39: 7 Russian, 32 Western.

Effect of the Intercalating Dyes Ethidium and Phenazinium Covalently Bound to the 5'- or 3'-Terminal of the Pentanucleotide d(pGAAAG) on the Thermodynamics of Complementary and Cooperative Interactions

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[Article by S.G. Lokhov, A.A. Koshkin, I.V. Kutyavin, M.P. Mityakin, M.A. Podyminogin, and A.V. Lebedev, Novosibirsk Institute of Bioorganic Chemistry, Siberian Department, Russian Academy of Sciences, Novosibirsk; manuscript received 3 Jun 93; after revision 24 Apr 94; UDC 577.113.6.088.53:543.422.25]

[FBIS Abstract] A study examined the effect that the intercalating dyes ethidium and phenazinium bound covalently to the 5' or 3'-terminal of the pentanucleotide d(pGAAAG) have on the thermodynamics of complementary and cooperative interactions. The thermal stability and thermodynamic parameters of the formation of six pentanucleotide complexes were studied along with those of the corresponding complexes of pentanucleotide derivatives with residues of the intercalating dyes N-(2-hydroxyethyl)-phenazine [Phn] or 2-N-(3-aminopropionyl)-ethidium [Etd] at their 5'- or 3'-terminals. The pentanucleotide derivatives were demonstrated to form the more stable complementary complexes. The best stabilizing effect was observed when the dye was oriented toward the long single-strand fragment of tetradecanucleotide. When the dye was oriented in such a manner, the melting points of the complexes were higher than those of the unmodified duplexes. Specifically, the melting points were 22.5°C higher (Phn) and 31.2°C higher (Etd) in the case of the 5'-derivatives and 21.6°C higher (Phn) and 27.2°C higher (Etd) in the case of the 3'-derivatives. In the "tandem" complexes (the fourth, fifth, sixth, and seventh of the six complexes studied), the constant of cooperative interaction of the pentanucleotide derivatives was higher than that of the unmodified pentanucleotide. In the case of complex 4, values calculated for the said constant (at 37°C) were as follows: unmodified, 33; 5'Phn, 35; 3'Phn, 57; 5'Etd, 190; and 3'Etd, 100. When $n = 3$ in complex 7, the constant of cooperative interaction approached 1 in all cases. Figures 2, tables 2; references 24: 10 Russian, 14 Western.

Enzymatic Transformations of Laminarans in 1→3;1→6-β-D-Glucans Possessing Immunostimulating Activity

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[Article by T.N. Zvyagintseva, L.A. Yelyakova, and V.V. Isakov, Pacific Ocean Institute of Bioorganic Chemistry, Far Eastern Department, Russian Academy of Sciences, Vladivostok; manuscript received 20 Jun 94; UDC 577.152.321*6.02]

[FBIS Abstract] A study examined the enzymatic transformation of laminarans in 1→3;1→6-β-D-glucans possessing immunostimulating activity. To find high-molecular-weight substances in the products of the action of the endo-1→3-β-D-glucanases LIV from *Spisula sachalinensis* and LO from *Chlamys albidus* on laminarans from *Laminaria chichorioides*, the researchers studied the molecular weight distribution of the said products by gel filtration on Sephadex G-50. In the products of the transformation of the said laminarans under the effect of endo-1→3-β-D-glucanase LO from *C. albidus*, the scientists isolated a new 1→3;1-glucan. The new transformation product, which was given the name translam, was determined to possess immunostimulating properties and to have a structure different from that of the starting laminaran. Translam was determined to have a higher molecular weight than the starting laminaran (approximately 8 kD as opposed to 5 kD) and to contain 2.5 times more 1→6 bound glucose residues concentrated mainly in the nonreducing end of the molecule. The 1→6-bound residues were also included in the main chain of the 1→3-β-D-glucan. The researchers were thus able to accomplish the enzymatic synthesis of a biologically active glucan from an inactive laminaran. The formation of translam was explained by the fact that during the transglycosylation process, the endo-1→3-β-D-glucanase LO is capable of catalyzing the synthesis of not just β-1→3-but also β-1→6-glucoside bonds. Figures 3, tables 5; references 19: 13 Russian, 6 Western.

Basic Problems of Psychohygiene in Connection With Problem of Chemical Weapon Destruction

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(manuscript received 6 Jul 94)

[Article by P.E. Shkodich and S.V. Klauchek; Scientific Research Institute of Hygiene, Toxicology and Occupational Pathology; Bulgaria] UDC 614.3/4:355]-07

[FBIS Abstract] Questionnaires concerning the ecological unsuitability of regions showed a high level of anxiety with a tendency to development of psychogenically

induced states and a need for psychoprophylactic measures among 12.2 percent to 14.2 percent of the respondents. There was evidence of chemophobia in regions in which potentially dangerous chemical objects were located. This chemophobia was characterized by an increased level of anxiety in proportion to proximity of the chemical danger; high potential for potests, subjective overevaluation of the environmental threat and its negative effect on health and scepticism about the local official medical and ecological data. It was recommended that the high level of chemophobia in connection with destruction of a chemical weapon be alleviated by the presentation of detailed and comprehensible information, creation of conditions for adequate assessment of personal risk in case of accidents, development of a concept of risk control, reduction of the aggressive symbolic significance of the environment and elimination of factors causing chemophobia. The high psychological stress on people in regions of destruction of a chemical weapon calls for development of special psychohygienic programs employing the use of electronic computer in formation which programs will provide adequate assessment of questionable situations and present information about methods of autopsychocorrection. References 14: 8 Russian; 6 Western.

Determination of Toxic Substances in Vodkas and Beverage Alcohols by Gas Liquid Chromatography Method

957A0718B Moscow GIGIYENA I SANITARIYA in Russian No 2, Mar-Apr 95 pp 50-51
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[Article by V.P. Gus'kova, P.F. Belyayeva, E.S. Georgiyev and L.S. Sizova; Kemerov Technological Institute of the Grain Industry; Kemerov Regional Center of State Sanitation and Epidemiological Inspection; UDC 613.81:615.9]-074:543.544]

[FBIS Abstract] A method of determining toxic substances in vodkas and beverage alcohols is described and discussed. The accuracy of the method was checked by the method of additions and by comparison with data obtained by arbitration. Discrepancies between the mean results calculated according to the t-criterion were statistically insignificant and lay within the framework of random scatter. The convergence of results of measurement of content of analyzed components did not exceed permissible errors of analysis. Overall error of measurement did not exceed 10 percent. The range of measured concentrations was: methyl alcohol 0.005-0.1 percent by volume; aldehydes 1.0-30 mg/dm³; compound ethers 10-100 mg/dm³; isobutyl alcohols 1-10 mg/dm³ and isoamyl alcohol 3-60 mg/dm³. The method makes it possible to determine the components studied and to

control their content at a level of and below hygienic norms. It is simple and decreases the time of analysis more than four-fold which is essential during series analyses. References 5 (Russian)

Improvement of Instruments and Methods of Their Use in Determining Microbial Contamination of Air

957A0718C GIGIYENA I SANITARIYA

in Russian (manuscript received 8 Apr 94)

No 2, Mar-Apr 95 pp 51-53

[Article by Ya.F. Kotenok and V.A. Kopysov; Kirov Pedagogical Institute imeni V.I. Lenin; UDC 615.471.03:614.718-078]

[FBIS Abstract] An attempt to improve devices and methods of determining total contamination of ambient air and the presence in it of microbes of a specific species involved proposal of an improved detection device (model M-25) which is highly effective, simple to use and offers the possibility of expanding its use in bacteriological practice. The improved model of the M-25 device can separate bacteria from the air in order to determine the contamination by microbes and can be used to study air in a hermetically sealed container, equipped with a bacteria filter and to determine density of a vaccine strain during aerogenic vaccination of animals. A procedure was developed for preparation of a model of a device, a trophoseparator, which isolates bacteria of a species sought when their content in a mixed culture is minimal. The experiment employed selective nutrient media for microbes of different species with both aerobic and anaerobic type of biological oxidation. Figures 3; references 9 (Russian).

Interaction of Dopamine and Opioid Receptors in Restoring Amnestic and Forgotten Memory Traces With Quinpirole

957A0707A Moscow EKSPERIMENTALNAYA I

KLINICHESKAYA FARMAKOLOGIYA

in Russian Vol 58 No 2, Mar-Apr 95

(manuscript received 9 Feb 94) pp 16-19

[Article by R. Yu Ilyuchenok, N. I. Dubrovina, Laboratory of Memory Regulation Mechanisms, Institute of Physiology, Siberian Division, Russian Academy of Medical Sciences, Novosibirsk; UDC 616.89-008.464-085]

[FBIS Abstract] Experiments with mice have revealed that a change in the functional state of δ and κ opioid re-

ceptors changes the spectrum of reactive effects of quinpirole, a selective agonist of D2-dopamine receptors, in amnesia and forgetfulness. In amnestic subjects, preliminary activation of δ receptors (with leu-enkephalin) and of κ receptors (with dynorphin) without quinpirole elicited no change in the amnestic state. When quinpirole alone was administered, the conditioned response of passive avoidance was restored. Quinpirole and leu-enkephalin resulted in increased effectiveness of quinpirole in restoring the passive avoidance response. Dynorphin and quinpirole reduced the reactive capability of quinpirole. In forgetfulness, quinpirole alone improved memory. Activation of δ receptors and quinpirole improved the response for a longer period. Activation of κ receptors and quinpirole had no effect. Quinpirole is found to be more effective in lessening amnesia than forgetfulness when used as a memory reactivator. Figure 1; tables 2; references 12: 4 Russian, 8 Western.

Comparative Characteristics of the Spectrum of Pharmacological Effect of Asaleptin and GCh-46

957A0707B Moscow EKSPERIMENTALNAYA I

KLINICHESKAYA FARMAKOLOGIYA

in Russian Vol 58 No 2, Mar-Apr 95

(manuscript received 7 Jun 94) pp 19-21

[Article by A. L. Tregubov, V. E. Kolla, Department of Pharmacology, Perm Pharmaceutical Institute; UDC 615.214.015.4.07]

[FBIS Abstract] Experiments on white mice and rats were used to compare the psychotropic properties of asaleptin and its derivative, GCh-46. The molecular structures of both substances are shown (GCh-46 has a NHCOCH_3 group attached to the heterocycle). The spectra differ substantially. Asaleptin is an atypical neuroleptic agent which does not have anticonvulsant properties. GCh-46, which retains some of the qualities of asaleptin, has definite anticonvulsant activity compared with similar traditional anticonvulsants. Tables present data on anticonvulsant activity, toxicity, and the spectrum of pharmacological activity for GCh-46, phenobarbital, carbamazepin, benzonal, and asaleptin. A table shows the psychotropic activity of GCh-46 and asaleptin in various tests. Compared to other anticonvulsants and asaleptin, GCh-46 has a much lower toxicity and wider pharmacological spectrum. In terms of psychotropic effects, even in toxic doses GCh-46 does not induce a cataleptic state. Figure 1; tables 2; references 12: 11 Russian, 1 Western.

Effect of Antidotes on Immune Response in Acute Intoxication With Dimethyldichlorovinyl Phosphate

957A0707C Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA
in Russian Vol 58 No 2, Mar-Apr 95 (manuscript received 19 Nov 93) pp 49-51

[Article by P. F. Zabrodskiy, Department of Toxicology, Saratov Medical University; UDC 615.917:661.718.1].015.4.07]

[FBIS Abstract] Experiments with CBA mice revealed that acute intoxication with the organophosphorus insecticide dimethyldichlorovinyl phosphate (dose of 1.0 LD50) caused an increase in the number of colony-forming cells in the spleen, and a reduction in the number of T-cells in the thymus, delayed hypersensitivity, natural and antibody-dependent cellular cytotoxicities, the number of cells forming antibodies to sheep erythrocytes in the spleen, and the production of antibodies to thymus-independent Vi-antigen. An antipain antidote (20 kg/kg) did not relieve the basic manifestations of post-intoxication immune deficiency and increased suppression of humoral immune response to sheep erythrocytes. Dipyrroxim (15 mg/kg) decreased the effect of the post-intoxication immune deficiency. Tables 2; references 14: 10 Russian, 4 Western.

Effect of Reaferon on Opioid Systems of Chronically Alcoholic Rats

957A0707D Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA
in Russian Vol 58 No 2, Mar-Apr 95 (manuscript received 30 May 94) pp 51-53

[Article by O. B. Petrichenko, A. M. Balashov, T. N. Alyabyeva, L. F. Panchenko, Institute of Medical-Biological Problems of Narcology, State Science Center of Narcology, Ministry of the Health and Medical Industry of the Russian Federation, Moscow ; UDC 616.89-.008.441.13-036.12-02:615.339:578.245]-092.9-07]

[FBIS Abstract] This paper studies the effect of recombinant α -interferon (reaferon) on the binding characteristics of μ - and δ -opioid receptors of the brain and the content of their endogenous ligands, β -endorphin and met-enkephalin in regions of the brain, blood and adrenals. Chronic alcohol intoxication is accompanied by a reduction in the affinity of μ -opioid receptors to ^3H -(D-ala-2, D-leu-5)-enkephalin when the content of these substances remains unchanged in the cortex of rat brains. There is also a decrease in the level of β -endorphin and met-enkephalin in the tissues and blood plasma. Daily administration of reaferon (10,000 IU) for four weeks completely restored the binding characteristics of the receptors and the content of the peptides that were studied. Tables 3; references 14: 5 Russian, 9 Western.

Computer Prediction of the Spectrum of Biological Activity of Chemical Compounds From Their Structural Formulas: The PASS System

957A0707E Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA
in Russian Vol 58 No 2, Mar-Apr 95 (manuscript received 27 Jan 94) pp 56-62

[Article by D. A. Filimonov, V. V. Poroykov, Ye. I. Karaicheva, R. K. Kazaryan, A. P. Budunova, Ye. M. Mikhaylovskiy, A. V. Rudnitskikh, L. V. Goncharenko, Yu. V. Burov, All-Russian Science Center for the Safety of Biologically Active Substances, Staraya Kupavna, Moscow Oblast ; UDC 615.2/.3.038:681.31]

[FBIS Abstract] This article describes the PASS computer system (Prediction of Activity Spectra for Substances), a way of reducing the costs and risks involved in developing new drugs. The system can predict the entire spectrum of activity of a substance, including possible side effects, by analyzing the chemical structure of a substance. This system broadens the base of knowledge available to pharmacologists and chemists and removes subjectivity in the evaluation of chemical compounds. The system formalizes the description of chemical structure and biological activity, maintains a database of chemical compounds and their activity, and compares chemical structures to predict activity. Each of these facets of operation is examined in detail. Examples are presented. The mathematical algorithm used to establish relationships and predict activity is described. Prediction with the PASS system is a factor of 2.5-3 more reliable than an expert opinion. In use at an institute there was on average a 70-80 percent coincidence of predicted results and experimental results. The system is useful in evaluating new compounds and optimizing paths of pharmacological research. The system is implemented on an IBM PC. Figure 1; tables 3; references 31: 26 Russian, 5 Western.

Sodiuretic Peptides: Biologically Active Substances

957A0707F Moscow EKSPERIMENTALNAYA I KLINICHESKAYA FARMAKOLOGIYA
in Russian Vol 58 No 2, Mar-Apr 95 (manuscript received 6 Dec 93) pp 63-65

[Article by I. B. Mikhaylov, M. L. Chukhlovina, Laboratory of Neuropharmacology and Growth Biochemistry of the Scientific Research Center of the Pediatric Medical Institute of St. Petersburg]

[FBIS Abstract] This paper discusses the classification, location of formation, action, and effects of sodiuretic peptides. The data indicate that it would be promising to study these endogenic substances for subsequent

creation of new drugs and to seek nontraditional approaches to the treatment of various illnesses. There are three types of these peptides (A, B, and C). Type A, the focus of this paper, is synthesized predominantly in the atrium. Rapid release is stimulated by stretching of the myoendocrine cells of the atrium. It may also be produced by neurons in the hypothalamus. Higher levels of secretion are noted in pregnancy, preeclampsia, and when angiotensin or thyroidal hormones are administered. There is an inverse correlation between the activity of renin in the plasma and the concentration of type A sodiuretic peptide. Production is affected by corticosteroids, catecholamines, estrogens, progesterone, and thyroidal hormones. Sodiuretic peptides have been found to affect secretion of aldosterone and insulin exchange. A correlation has been found between type A sodiuretic peptide and blood pressure, both diastolic and systolic. Type A affects electrolyte and water homeostasis, increasing the excretion of sodium in the urine, and in higher doses, the excretion of magnesium, calcium, and potassium. Effects on the hypothalamus and thymus are discussed. Normalization of blood levels of type A sodiuretic peptide is effective in treating cardiac incompetence (including congenital cardiac incompetence). References 49: 10 Russian, 39 Western.

Effect of Low Doses of Irradiation on the Survival of Cells and Their Descendants

957A0533A Moscow *IZVESTIYA AKADEMII NAUK: SERIYA BIOLOGICHESKAYA*, No 2, Mar-Apr 95 pp 137-141

[Article by A.A. Alferovich, V.Ya. Gotlib, and I.I. Pelevina, Chemical Physics Institute imeni N.N. Semenov, Russian Academy of Sciences, Moscow; manuscript received 26 May 93; UDC 577.391]

[FBIS Abstract] A study examined the effect of low doses of irradiation on the survival of cells and their immediate and distant descendants. All of the experiments were performed with a single layer of cells in the stage of exponential growth. The cells were irradiated by γ -radiation units and also exposed in the 10-km zone surrounding the Chernobyl Nuclear Power Plant. The individual cell layers were irradiated at room temperature in either acute or prolonged regimens. Cells irradiated in the acute regimen were placed in Petri dishes and irradiated (by a GUT ^{60}Co γ -radiation unit) in doses of 10, 20, and 40 cGy at a dose rate of 75 cGy/min. Cells irradiated in the prolonged regimen were placed in flasks and irradiated (by an ETsU-100 ^{137}Cs unit) in doses of 10 and 20 Gy at a dose rate of 3 cGy/day and in a dose of 40 cGy at a dose rate of 12 cGy/min. The cells placed in flasks and exposed to the γ -radiation resulting from the Chernobyl disaster received doses of 500 μGy (1 mR/h) and 5 cGy (100 mR/h) over a 2-week period or 10 cGy (100 mR/h) over a 4-day period. Af-

ter irradiation, the cells were placed in Petri dishes in a concentration resulting in 200-300 colonies per dish and cloned for 8-9 days. Clones containing at least 50 cells were counted as survivors; clones with fewer cells were considered aborted. First, the effect of irradiation on a cell's cloning efficiency was examined over the course of 11 passages. Irradiation in doses of 10-40 cGy had no effect on cell survival. Next, the effect of irradiation on the frequency of giant cells in the single layer of cells and in individual clones was studied. After the single layers of cells had been irradiated in a dose of 40 cGy, the percentage of giant cells in them increased in the populations of the first and second passages (in generations 3-7) by 63 and 26 percent, respectively. The percentage of giant cells in the zero and first passages was also studied. After irradiation in doses of 10, 20, and 40 cGy, the percentages of giant cells in the zero passage equaled 23, 38, and 200 percent, respectively, and the percentages in the first passage amounted to 33, 25, and 33 percent, respectively. The giant cells appeared to form de novo in each passage. The experiments studying the effects of prolonged irradiation established that after 20 cGy of irradiation, the percentage of giant cells increased by 34 percent in the first passage. Prolonged irradiation in a dose of 40 cGy resulted in increases in the percentage of giant cells in the first and second passages by 61 and 31 percent, respectively. In other words, prolonged irradiation in doses as low as 20 cGy result in disorders that can be registered in cells for at least three generations. The descendants of cells irradiated in a dose of 40 cGy possessed elevated levels of giant cells for seven generations. Thus radiation causes the reproductive death of cells for several generations, with the absolute magnitude of the effect observed increasing as the irradiation dose increases. Tables 5; references 17: 12 Russian, 5 Western.

Changes in the Rate of Protein Biosynthesis in Mouse Organs Under the Effect of Delta Sleep-Inducing Peptide and Psychoemotional Stress

957A0533B Moscow *IZVESTIYA AKADEMII NAUK: SERIYA BIOLOGICHESKAYA*, No 2, Mar-Apr 95 pp 141-148

[Article by G.T. Rikhireva, I.S. Sokolova, A.V. Rylova, and S.A. Kopylovskiy, Chemical Physics Institute imeni N.N. Semenov, Russian Academy of Sciences, and I.I. Mikhaleva and I.A. Prudchenko, Bioorganic Chemistry Institute imeni M.M. Shemyakin, Russian Academy of Sciences, Moscow; manuscript received 31 Jan 94; UDC 612.8.015]

[FBIS Abstract] The mechanisms of the adaptogenic effect of delta-sleep-inducing peptide (DSIP) were examined in three series of experiments performed to identify the effect of DSIP and its two synthetic analogues ID-6 and ID-12 on the rate of protein biosynthesis in the brain, liver, and spleen of male mice of the SHK and

BALB/c lines. The experiments were conducted at three different times as follows: SHK mice weighing 18 to 22 g each were studied in July 1990, SHK mice weighing 15 to 18 g each were studied in February 1991, and BALB/c mice weighing 16 to 22 g each were studied in June 1992. The mice were given single injections of DSIP or its analogues in a dose of 120 $\mu\text{g/kg}$ body weight. The peptides were dissolved in a physiologic solution and the volume injections received by the mice ranged from 0.1 to 0.2 ml depending on the weight of the individual mouse. The mice were divided into the following groups: control (animals injected with a physiologic solution); DSIP (animals injected with DSIP as specified above); analogue (animals injected with one of the DSIP analogues); stress (animals subjected to psychoemotional stress 1 hour after having been injected with the physiologic solution); DSIP + stress (animals subjected to psychoemotional stress 1 hour after having been injected with the DSIP); and analogue plus stress (animals subjected to psychoemotional stress 1 hour after having been injected with one of the DSIP analogues). A 30-minute-long tape-recorded cry of alarm accompanied by bright flashing light and periodic loud noise served as the source of psychoemotional stress. The radioisotope method was used to study the effects of the DSIP and its analogues on the rate of protein biosynthesis in the animals' brains, livers, and spleens 3, 4.5, 6, and 9 hours and 1, 2, and 3 days after the injections. A statistical analysis of the data collected on intact animals (i.e., animals not subjected to psychoemotional stress) during all three series of experiments established that a single injection of DSIP or its analogues activates protein biosynthesis in the mouse brain regardless of the line of animal or time of year. No such regular effect of DSIP or its analogues on the livers and spleens of intact mice could be established, however. All three peptides had a modulating effect on the system regulating protein biosynthesis in the brains of mice placed under psychoemotional stress. In the spleen and liver, on the other hand, the effects of injection of DSIP appeared to depend on the line of mouse, the sexual maturity of the mouse, the time of year, and possibly other factors not considered. Specifically, in the SHK mice the injections resulted in an increase in rate of protein biosynthesis by a factor of 3.5, whereas in the BALB/c mice, the injections increased the rate of protein biosynthesis by a factor of approximately 1.5. DSIP had the weakest modulating effect. Interestingly, ID-6, which induced the greatest activation of protein biosynthesis in intact animals, proved to be the strongest modulator of the three peptides studied. The rate of protein biosynthesis in the liver in response to the peptides also varied by mouse line: At 4.5 hours after the injections, the rate of protein biosynthesis in the livers of the SHK mice re-

mained unchanged but was significantly reduced in the livers of the BALB/c mice. One day after the injections, activation of protein biosynthesis was observed in both lines of mice. Overall, the peptides has a modulating effect on the system regulating protein biosynthesis in the livers of stressed mice. DSIP affects the spleens of intact and stressed mice differently. Overall, ID-6 and DSIP both suppressed protein biosynthesis in the spleen early (4.5 hours) after the injections. It was thus proposed that a modulating effect on the protein biosynthesis system is part of DSIP's adaptogenic effect mechanism. Figures 3, table 1; references 19: 7 Russian, 12 Western.

Effect of Spaceflight Factors on the Proliferative Activity of Cells of Different Eye Tissues During Lens Regeneration in the Spanish Newt *Pleurodeles waltli*

957A0533C Moscow IZVESTIYA AKADEMII NAUK:
SERIYA BIOLOGICHESKAYA, No 2, Mar-Apr 95
pp 149-156

[Article by N.V. Brushlinskaya, Developmental Biology Institute imeni N.K. Koltsov, Russian Academy of Sciences, Moscow; manuscript received 9 Nov 94; UDC 59.596/599]

[FBIS Abstract] The proliferative activity of various eye tissues during regeneration of the lens under normal ground conditions was compared with that under the effects of various factors associated with spaceflight. The experiments were performed on newts (*Pleurodeles waltli*) on the biosatellite Kosmos-1887 from 31 September through 13 October 1987 and on the biosatellite Kosmos-2044 from 15 through 29 September 1989. The newts used during the first experiment were six months old at the time of the experiments and weighed an average of 6.0-7.0 g each, whereas those used in the second experiments were two months old and weighed an average of 4.5-5.1 g each. In the first experiment, the newt's rear limbs and the lenses of their eyes were removed on days 14 and 7 before the start of the experiments, respectively. In the second experiment, the newts' rear limbs and lenses were removed on days 24 and 13 before the experiments were begun. In both experiments, two days before the start of the experiments, the experimental newts and intact controls were placed in a Triton biologic container (a 300 x 200 x 80-mm metal box whose cover was fitted with an air-permeable fluoroplastic membrane and whose bottom was lined with moisture-retaining hygroscopic medical fabric) that was then filled with 500 ml of tap water. An additional series of experiments involving a vibrobench and centrifuge was conducted to simulate the effects of landing and takeoff. Regeneration of the newts' tissues was estimated on the basis of both qualitative mor-

phological characteristics and quantitative morphological indicators. The newts were administered intravenous injections of ^3H -labeled thymidine to permit study of their proliferative activity. On the day of landing, the sizes of the regenerates of the experimental and control animals were virtually the same. On day 14 after the spaceflights had ended, however, the regenerates of the animals exposed to the conditions of spaceflight were somewhat more advanced than those of the controls. After the spaceflight, the newts manifested significantly elevated indices of ^3H -thymidine-labeled nuclei in their lens regenerate, the ciliary zone of their iris, and the growth zone of their retina, which is to say in eye tissues that are not directly involved in the regenerate cell population's formation. The rate of increase in regenerate size was higher in the experimental newts than in the controls (0.1145 versus 0.0537 mm²). The enhanced proliferative activity, accelerated lens regeneration, and large size of the regenerates observed in the animals that had been in space were linked to hormonal changes that occurred under the effects of spaceflight conditions. It was hypothesized that changes in calcium metabolism under conditions of microgravity, especially increased prolactin production, accelerate regeneration of both the lenses and limbs of *P. waltli*. Tables 6; references 39: 10 Russian, 29 Western.

Method of Searching for Correlations Between Hydrobiological Indicators and Abiotic Factors by Way of the Example of Commercial Fish Catches and Productivity

957A0533D Moscow IZVESTIYA AKADEMII NAUK: SERIYA BIOLOGICHESKAYA, No 2, Mar-Apr 95
manuscript received 17 Jan 94; pp 218-225

[Article by N.G. Bulgakov, V.G. Dubinina, A.P. Levich, and A.T. Terekhin, Biology Department, Moscow State University imeni M.V. Lomonosov, Moscow; manuscript received 17 Jan 94; UDC 577.4]

[FBIS Abstract] A method of determining ecologically tolerable levels of selected abiotic factors linked to fluctuations in fish populations was proposed. The ecosystem of the Lower Don was studied, and factors related to decreases in the sizes of commercial catches of bream, sabrefish, pike perch, and Volga zander in the waters of the Don River were identified. The main difference between the proposed indicator "ecologically tolerable level" [ETL] and the familiar maximum permissible concentration [MPC] is that an MPC is developed with consideration for just the isolated effect of chemicals on

the body under idealized laboratory conditions whereas the ETL considers the combined effect of an entire set of abiotic factors on an integrated community in a real ecosystem. In the case of fish populations, the indicator ETL would be developed with consideration for the effects of abiotic factors not just on fish but also on all intermediate levels in the food chain. Other differences between the ETL and MPC are as follows: the ETL makes it possible to identify factors having an adverse effect on life forms (such as fish) for which no monitoring program has previously been stipulated because specialists assumed a priori that the said factors have no effect on the biota; the ETL norms not just chemical but all other hydrologic and climatic factors; the ETLs of significant factors are not universal but are instead strictly regional and make allowances for the unique background features of given regions and the adaptability of the bionts of specific ecosystems; the ETL method makes it possible to consider multiple-year delays in animals' (in this case fish) responses to dangerous levels of factors' effect on the environment, whereas evaluations of the environment based on determining MPCs can only consider the previous 6-8 months; and the concept of the MPC is based on norming either instantaneous or cumulative concentrations of substances, whereas the concept of the ETL is based on both averaged values of factors and extremal values of the said factors for a specified time period. ETLs thus make it possible to standardize both accidental and regular discharges of substances. The concept of the ETL enabled scientists to identify the main factors linked to decreasing commercial catches of different types of fish in the Lower Don Basin. The list of factors important for the river ichthyocenosis differed from that of factors important for the water reservoirs' ichthyocenosis. Moreover, the lists of factors for the different species of fish inhabiting the water reservoirs differed from one another. In the case of pike perch and Volga zander catches, the most important factors were chemical oxygen demand and the concentration of zinc. In the case of bream catches, the most important factors were the concentration of nitrite nitrogen, suspended substances, and chlorides and the average seasonal pH. In the case of sabrefish, the most important factors were the concentration of nitrogen-containing ions, copper, and zinc; temperature in May, October, and November; average seasonal water level; pH in April; and the median biochemical oxygen demand calculated on day 5 [BOD₅]. The most important factors affecting catches of bream and sturgeon in the Don were as follows: the concentration of nitrite nitrogen, hexachlorane, oxygen, phenols, sulfates, and zinc and the pH level in March and May. Figure 1, tables 6; references 7 (Russian).

Degradation of Technogenic Flows of Organic Matter by Communities of Microorganisms and Protozoans

957A0533E Moscow IZVESTIYA AKADEMII NAUK: SERIYA BIOLOGICHESKAYA, No 2, Mar-Apr 95 pp 226-230

[Article by Yu.L. Gurevich, V.P. Ladygina, and M.I. Teremova, Biophysics Institute, Siberian Department, Academy of Sciences; manuscript received 12 Jan 94; UDC 576.8+593.1:577.74+662.71:628.35]

[FBIS Abstract] A study examined the transfer of matter and reaction of bacteria and protozoans in situations where a community of microorganisms or protozoans is utilizing a technogenic flow of organic compounds. The experiments focused on degradation of phenol and naphthalene by cultures of *Pseudomonas* spp. In all of the experiments, protozoans were represented by infusorians of the genus *Colopoda*. The inoculate used to select the bacterial and protozoan cultures was taken from equipment used to clean phenol-containing waters. The experiments were performed in a single-stage chemostat with a culture volume of 350 ml and temperature of 36-37°C. The pH of the naphthalene and phenol cultures ranged from 7.0 to 7.5 and 6.7 to 6.9, respectively. A magnetic stirrer and aeration were used to agitate the cultures. The flow rate in the various experiments ranged from 0.06 to 0.27/h. The nutrient medium was based on tap water and included NH_4Cl , KH_2PO_4 , NaHPO_4 , and MgSO_4 mineral salts and phenol (0.8-1.0 g/l) or naphthalene (2.0-4.0 g/l). In the experiments involving naphthalene, the culturing unit had an attachment to feed slightly soluble substrate into the culture. The concentration of biomass in the culture was determined at the culture device's outlet by the dry weight of the centrifuge sediment. The protozoans were counted in a Goryayev chamber. The residual concentration of phenol was measured photocolorimetrically by its reaction with 4-aminoantipyrine, and the residual concentration of naphthalene was determined by gas chromatography. Qualitative control of metapyrocatechase activity on the part of the bacteria was determined in a sample of whole cells with pyrocatechin. The experiments examining the degradation of naphthalene and phenol lasted 5 and 3 months, respectively. In the first stage of the studies, the characteristics of bacterial growth on phenol were determined. In the range of flow rates from 0.07 to 0.27/h, phenol was utilized with an efficiency of 0.61 g/g. The half-saturation constant and maximum specific growth rate calculated for the said range of flow rates amounted to 0.37 mg/l and 0.34/h, respectively. The residual phenol concentration generally amounted to 0.2 mg/l or less. The kinetic characteristics of bacterial growth on naphthalene were not determined because of problems in obtaining a suf-

ficiently exact measurement of its concentration at the culture unit's entrance at any given moment in time. The concentration of biomass fluctuated around 1.0 g/l, and the naphthalene was utilized with an efficiency of 0.6 g/g. The residual concentration of naphthalene was less than 0.2 mg/l. Predation was unequivocally established to play a role in the transformation of both organic compounds studied. When the bacterial cultures were provided with phosphorus, adding protozoans to the cultures resulted in an increase in the residual concentration of substrate. When the influx of phosphorus was limited, the quality of carbohydrate removal from the waters was restored. When phosphorus was circulated in the culture, the residual concentrations of phenol and naphthalene decreased on average to those values that are established in cases of degradation of the said compounds in cultures without protozoans. In the presence of protozoans, degradation of phenol and naphthalene occurred solely by the ortho-pathway. In monocultures, on the other hand, degradation occurred by the meta-pathway. Figures 2, tables 2; references 16: 8 Russian, 8 Western.

New Model of Experimental Depression-Like Syndrome Induced by Systemic 1-Methyl-4-Phenyl-1,2,3,6-Tetrahydropyridine (MPTP) Injection in Rats

957A0806A Moscow ZHURNAL VYSSHEY NERVNOY DEYATELNOSTI IMENI I. P. PAVLOVA in Russian Vol 45 No 2, Mar-Apr 95 (manuscript received 11 Apr 94, after revision 21 Sep 94) pp 377-387

[Article by G. N. Kryzhanovskiy, N. A. Krupina and V. G. Kucheryanu, General Pathology and Pathophysiology Scientific Research Institute, Russian Academy of Medical Sciences; UDC 612.821.6+616.895.4+612.8.015+615.78]

[FBIS Abstract] Since experimental Parkinsonism can be induced in rats by the systematic injection of MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine), it was postulated that with the use of MPTP in a less severe course than necessary for producing this Parkinsonism effect extrapyramidal disorders in animals would be less expressed, affording a possibility for evaluating the presence and character of both motor inhibition and emotional-behavioral changes in rats. A study was therefore made of the possibility of developing a depression-like syndrome in rats with the chronic injection of MPTP. The dynamics of appearance and maintenance of emotional-behavioral disorders in male Wistar rats was studied during and after repeated daily intraperitoneal injection of the neurotoxin MPTP in a dose 15 mg/kg for 18 days. This MPTP injection

caused suppression of locomotion and rearing in an open field test, decrease in total daily fluid intake and preference for a 10 percent saccharose solution over water, increase in duration of immobility and a rise in the depression index simultaneously with a change in the rhythmological structure of the disadaptation type in a forced swimming test. The behavioral changes in these animals persisted for not less than a week after suspension of MPTP injection. The appearance and development of a state of decreased motivation simultaneously with anhedonia and behavioral despair in response to MPTP injection can be regarded as a new model of the depression-like syndrome in rats. Relative to many other models it is far simpler and more readily reproducible. Figures 4; references 24: 6 Russian, 18 Western.

Accumulation of Gold (III) by Cells of *Spirulina platensis* Cyanobacteria

957A0825A Moscow MIKROBIOLOGIYA in Russian
Vol 64 No 2, Mar-Apr 95 pp 192-196

[Article by V.I. Karamushka, T.G. Gruzina, and Z.R. Ulberg, Biocolloidal Chemistry Institute, Ukrainian Academy of Sciences, Kiev; manuscript received 28 Apr 94; UDC 579.695]

[FBIS Abstract] The process of accumulation of gold (III) by cells of *Spirulina platensis*, which is a member of the bacterial subgroup Cyanobacteria, was studied. A culture of *S. platensis* obtained from the Biochemistry of Algae Department of the Botany Institute imeni N. Kholodnyy of the Ukraine Academy of Sciences was grown in 500-ml test flasks under a DS-40 diene lamp (illuminance, 2,000-3000 lux). The incubation medium contained the following (mg/l): NaHCO_3 , 8,000; NaNO_3 , 1,640; $\text{K}_2\text{HPO}_4 \cdot 3\text{H}_2\text{O}$, 190; K_2SO_4 , 500; NaCl , 200; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 250; CaCl_2 , 20; $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 10; and ethylenediamine tetraacetic acid [EDTA], 10. Also included in the culture medium was 1 ml of a solution of the following trace elements in EDTA (mg/l): $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$, 22; MnSO_4 , 1,080; $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 79; $\text{H}_3\text{B}_3\text{O}_3$, 2,630; $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$, 1,000; $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, 9,300; CaCl_2 , 1,200; and $\text{Co}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$, 20. Before the experiments, the required volume of cellular suspension was centrifuged, reprecipitated in a solution of 10 mM *tris*-HCl, and resuspended in the same buffer. A solution of gold and hydrochloric acid was added to the cellular suspension to a final concentration of 30 $\mu\text{mol/l}$. The cells were subjected to heat inactivation by reincubating the vessel containing the cell suspension a water bath at 85-90°C for 10-15 minutes. The experiments established that *S. platensis* is capable of concentrating gold (III) in an energy-dependent matter. It was discovered that

the gold accumulation process depends on pH (accumulation was highest in the alkaline range of the pH scale) and is affected by biologically active substances. Sodium azide (NaN_3) and dicyclohexylcarbodiimide suppressed the *S. platensis* cells' ability to accumulate gold ions and thus provide a way of controlling the process. It was concluded that the concentration of gold (III) by *S. platensis* cells is a complex process consisting of passive binding by cellular structures and energy-dependent localization of the metal in the cell. Figures 5; references 19: 9 Russian, 10 Western.

Microbe Detoxification of Wastewaters From the By-Product Coke Industry

957A0825B Moscow MIKROBIOLOGIYA in Russian
Vol 64 No 2, Mar-Apr 95 pp 197-200

[Article by L.A. Golovleva, Z.I. Finkelshteyn, B.P. Baskunov, R.M. Aliyeva, and L.G. Shustova, Biochemistry and Physiology of Microorganisms Institute, Russian Academy of Sciences, Pushchino, and Microbiology and Virology Institute, Kazakhstan Academy of Sciences, Alma-Ata (Almaty); manuscript received 27 Jan 94; UDC 579.873.6.017.7]

[FBIS Abstract] A series of experiments were performed to find microorganism cultures capable of detoxifying wastewaters generated in the by-product coke industry. Microorganisms capable of destroying aromatic hydrocarbons were isolated from the wastewaters of the Karaganda Metallurgy Combine and from the soil of the territory of the combine's sewage treatment equipment. The microorganisms were isolated by the method of inoculation into agarized media with various aromatic hydrocarbons serving as the sole carbon source (200 mg/l). Naphthalene and cresol were placed on the cover of a Petri dish, and biphenyl and phenanthrene were added to the agarized medium in the form of acetone solutions that had been sterilized through membrane filters. The cultures were identified through the generally accepted methods. The cultures' ability to degrade aromatic hydrocarbons and the components of the tar water generated in the by-product coke industry was tested in flasks containing a mineral medium with two drops of a saturated solution of FeCl_3 and aromatic compounds or (tar water) and the following (g/l): NH_4NO_3 , 1; K_2HPO_4 , 1; KH_2PO_4 , 1; MgSO_4 , and 0.2; CaCl_2 , 0.02. The cultures were grown under intermittent conditions at 28°C. Consumption of the tar water's components was controlled by gas chromatography, and the main components of the resin and tar water were identified by chromatography-mass spectrometry. As a result of the experiments, a collection of microorganisms was created that actively degrades the phenols, cresols, xylenols, naphthalenes, and phenan-

threne present in the wastewaters generated by the by-product coke industry. Most of the active strains in the collection were pseudomonads (*Pseudomonas aureogaciens*, *Pseudomonas fluorescens*, and *Pseudomonas sp.*). The collection of bacterial strains proved able to reduce the cresol-xylene and polyaromatic fractions of the by-product coke industry wastewaters by 70 percent within 7 days. The identified bacterial strains also proved capable of growing on individual aromatic compounds (isomeric cresols, naphthalene, phenanthrene). The various metabolism products of the bacterial strains were studied. The structures of five intermediate products of phenanthrene oxidation were identified by chromatography and mass spectrometry. Figures 3, tables 2; references 5 (Western).

Modification of Microbiological Methods for Increasing Oil Recovery in Conditions of Water-Flooded Strata

957A0825C Moscow *MIKROBIOLOGIYA* in Russian
Vol 64 No 2, Mar-Apr 95 pp 287-288

[Article by R. Ibatullin, Tatar Scientific Research and Design Institute for Petroleum, Bugulma; manuscript received 23 Feb 94; UDC 622.276.6:576.8]

[FBIS Abstract] Most of Tatarstan's oil reserves are located in water-flooded strata. In the past decade, intensive effort has been under way to test and use a microbiological method of increasing the amounts of oil recovered from the water-flooded strata typical of Tatarstan based on partial oxidation of the residual oil by microdisplacing agents (CO_2 , lower fatty acids and alcohols, surfactants, etc.). The effectiveness of the said method has decreased as more of Tatarstan's oil reserves have been recovered. In view of this fact, two new methods have been proposed for extracting more oil from Tatarstan's water-flooded oil-bearing strata. The first method entails adding an additional supply of hydrocarbons to the critical zone. The second method is based on optimizing the microbiological recovery process parameters, especially during the period of activation of the aerobic microorganisms, and combining cycles of hydrodynamic and microbiological processes. In the first case, activation of the stratal microflora has made it possible to intensify the course of the microbiological processes considerably: Whereas conventional activation has made it possible to increase the intensity of methane formation by a factor of 1.1-1.2, the use of an additional supply of carbons makes it possible to intensify methane formation by a factor of 2.6-3.9. The second approach entails using a regimen of cyclic water pumping to activate the stratal microflora directly before the pressure in the strata is reduced. The technique has made it possible to increase the period of development

of biocenosis in the zone of optimal concentrations of nutrients to 10-30 days at different test sites. In tests at three sites in Tatarstan, the new modifications of microbiological oil recovery methods boosted oil recovery by 1,770, 13,400, and 176 metric tons, respectively. Figure 1, table 1; references 5 (Russian).

Epidemiological Features of Cholera in Dagestan Republic. Evaluation of Some Antiepidemic Measures

957A0854A Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian
No 2, Mar-Apr 95 pp 9-22

[Article by G. G. Onishchenko, Yu. M. Lomov, E. A. Moskvitina, V. I. Chiburayev, M. L. Lyakhover, M.-R. A. Rokhoyev, A. N. Terentyev, B. M. Asvarov, S. N. Chernyshev, S. Z. Gadzhieva, F. M. Ismailov and N. P. Bugakov, RF State Committee for Sanitary and Epidemiological Oversight, Moscow; Antiplague Scientific Research Institute, Rostov-na-Donu; Dagestan Republic State Committee for Sanitary and Epidemiological Oversight; Dagestan Antiplague Station, Makhachkala]

[FBIS Abstract] A retrospective analysis was made of epidemic manifestations of cholera in the Dagestan Republic using materials from an operative epidemiological analysis of the outbreak of 1994. The influence of climatic-geographic, sociodemographic and sanitary-hygienic characteristics is assessed. There was a drawn-out (more than 4 months) cholera epidemiological process engendered by pilgrims from Southwest Asia. The general patterns of development of the epidemiological situation and the principal paths of transmission of the infection are discussed. The circumstances accounting for the involvement of such a large number (180) of populated places in the republic in the epidemiological process are outlined. Very important factors favoring spread of the infection included migration within the republic and pilgrimage to Saudi Arabia, unemployment, local traditions and customs involving assembly of large numbers of people, close contact with relatives and unsatisfactory public services (water supply and sewers) in virtually all settlements. The efficacy of the antiepidemic measures invoked and the important role of the organized specialized antiepidemic teams in the operative conducting of measures at the foci of the infection, including mass examination of the inhabitants of populated places, is emphasized. It is clear that the epidemiological situation is unstable and that the infection could take root. The prediction for 1995 is unfavorable and the situation is aggravated by the military, social and economic conditions in the adjoining Chechnya Republic, where cholera also was registered in 1994.

Operative Analysis of Cholera Epidemic in Dagestan Republic Using Computer Database

957A0854B Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 22-27

[Article by E. A. Moskvitina, G. G. Onishchenko, Yu. M. Lomov, A. G. Varivoda, M. L. Lakhover, O. Yu. Naydina, A. A. Gadzhieva, Ye. Yu. Kakbayeva, S. N. Chernyshev and N. V. Larchenkova, Antiplague Scientific Research Institute, Rostov-na-Donu; Dagestan Republic State Sanitary and Epidemiological Oversight Center of Dagestan Republic]

[FBIS Abstract] Epidemiological information for the cholera epidemic in Dagestan during the period 6 June-21 October 1994 (2,327 victims and vibrio carriers, detected in 184 populated places in 27 rayons, eight cities and one settlement) was processed using IBM-compatible computers. A database OPERATIVNYY EPIDANALIZ was organized in which the collected data were systematized and analyzed. The purpose of the database was daily replenishment, accumulation, storage, retrieval, mathematical and graphic processing of data and printout of necessary materials. The different components of the database are discussed. The data include pertinent dates, affected populated places, rayons and cities, demographic data, distribution of the sick and vibrio carriers by social position and much similar information. A data recovery system makes it possible to obtain tabulated or graphic materials. Some of the materials processed using the databank are summarized. For example, the index of incidence of cholera per 100,000 population was 55.3 and the level of infection was 116.1; in the city these indices were 28.4 and 52.1, less than half those for rural areas, for which the indices were 72.5 and 159.6 respectively. In the mountainous rayons the indices of infection were from 2.9 to 1,212.4, in the foothill rayons — from 19.2 to 558.9 and in rayons on the plains — from 6.4 to 656.7. Three different periods in development of the epidemic process could be characterized. Use of the database, a series of programs and database management system made it possible to trace the level and dynamics of the disease and the level of infection, to ascertain the risk territory, age and social risk groups, effective paths and factors involved in the transmission. The database can be used for the analysis of operative and epidemiological information for cholera and other infections. Figures 3; references: 5 Russian.

Mechanisms of Intrafocal and Territorial Spread of Cholera in Dagestan Republic

957A0854C Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 27-30

[Article by G. M. Grizhebovskiy, B. M. Asvarov, V. A. Popov, Yu. M. Yevchenko, V. N. Savelyev, V. I. Yefremenko, M. L. Lyakhover, M.-R. A. Rokhoyev, Sh. Z. Kadiyev, M. M. Seidova and O. I. Taran, Stavropol Antiplague Scientific Research Institute; Dagestan Antiplague Station; Dagestan Republic State Sanitary and Epidemiological Oversight Center, Makhachkala; Derbent Sanitary and Epidemiological Oversight Center]

[FBIS Abstract] Epidemic manifestations of cholera in the Dagestan Republic during the period of the seventh pandemic, with the operation of such common transmission paths as water, food and contact-household, are described and their role in the territorial spread of the infection is evaluated. The findings from the epidemics of 1970 and 1973 are included as background for analyzing the 1994 situation. An analysis was made of family foci in Derbent city (84 foci) and rural Kayakentskiy Rayon (38 foci), during what was by far the worst cholera epidemic there during the pandemic. Among these family foci the percentage with two or more cases of infection was quite high: in Derbent — 37.6 percent and in the rural areas — 43.3 percent. There also were foci with 4-7 cases. One operative factor was an acute shortage of high-quality drinking water. This appears to be one of the main paths for introduction of the vibrio into the family. It was concluded that with the poor sanitary conditions in human dwellings the importation of cholera into them was accompanied by widespread infection among family members, close relatives and inhabitants of individual populated places visiting one another for business or personal reasons and subjected to the influence of the water, contact and food transmission factors. Good evidence was found for validating these conclusions, although in the case of food transmission the evidence was indirect rather than direct. However, it was ascertained that the Samur-Derbent irrigation canal, passing through the entire rayon, played no role in the spread of cholera. In only 1 of 408 samples was the cholera vibrio isolated and that was probably of very local origin. References: 4 Russian.

Use of Cholera Coagglutination Diagnosticum During Cholera Epidemic in Dagestan

957A0854D Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 30-32

[Article by G. M. Orlova, L. B. Adimov, O. V. Goncharova, V. V. Korol, O. P. Fetsaylova, L. M. Smolikova, V. N. Savelyev, N. I. Dimitrova, A. K. Kiseleva, V. N. Neklyayev, A. Yu. Goncharov, A. A. Amirkhanov, I. Ya. Cherepakina, O. I. Pomukhina, L. D. Makedonova, I. Ye. Ushakova, G. K. Gurevich, A. M. Pyatibratov and A. V. Karagozova, Anti plague Scientific Research Institute, Rostov-na-Donu; Anti plague Scientific Research Institute, Stavropol; Khasavyurtov Center, Dagestan Republic State Committee for Sanitary and Epidemiological Oversight]

[FBIS Abstract] A dry cholera diagnosticum for the glass slide coagglutination reaction, having a high activity and specificity, making it possible to detect the causative agent of cholera in the investigated material with a minimum concentration 10^6 - 10^8 microbial cells/ml, was developed. The preparation procedures are described. The most promising preparation was based on a serum to the Eltor vibrio of the strain 5879; it manifested a high specificity and did not agglutinate vibrios of the non O1 group. This preparation was used by specialized antiepidemic teams in Izberbash and Khasavyurt cities. In Izberbash, for example, 26,783 cholera analyses were made and 236 cultures of *V. cholerae* eltor were isolated. In Khasavyurt the coagglutination reaction was used in studying 102 samples, in 22 of which *V. cholerae* was detected. The diagnosticum was therefore used effectively during the cholera epidemic in Dagestan in the detection and accelerated identification of the causative agent, although on a limited basis. In all cases the positive results of the coagglutination test were confirmed by other research methods (no cases of hyperdiagnosis were registered). The production of such diagnosticums in small batches at specialized research laboratories is recommended. References 8: 5 Russian, 3 Western.

Epidemiological Features of Cholera in Mountainous Shamil'skiy Rayon of Dagestan

957A0854E Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 33-34

[Article by Yu. G. Kireyev, V. V. Batashev, O. S. Khadartsev, M. Kh. Turyanov, S. K. Derlyatko, M. L. Lyakhover, B. M. Asvarov and B. M. Omarov, Anti plague Scientific Research Institute, Rostov-na-Donu; Dagestan Republic State Sanitary and Epidemiological

Oversight Center, Makhachkala; Dagestan Anti plague Station; Shamil'skiy Rayon State Committee for Sanitary and Epidemiological Oversight Center]

[FBIS Abstract] During the republic-wide cholera epidemic of 1994 it was the mountainous Shamil'skiy Rayon which was most seriously affected. The infection was imported from Gergebil'skiy and Unsukul'skiy Rayons. The villages Golotl, Rugelda and Khebda were the most important foci. The holding of well-attended feasts and ceremonies was a significant factor contributing to spreading of the disease. It was possible to make a rather reliable determination of exactly how the infection was propagated. During the period 18 July-3 September in this rayon (including patients in local health facilities from adjacent areas) there were 158 patients afflicted with cholera and 115 vibrio carriers. With respect to the gravity of the disease the light form accounted for 82.9 percent of the cases; the severe form accounted for 10.8 percent; 2 deaths occurred. The most afflicted age groups were 50-59 years and 60 and older. With respect to transmission path, 48.4 percent of the cases were attributable to the contact-household path and 46.5 percent to food. One of the distinctive features was the absence of the water factor in disease transmission. Although the vibrio was found in reservoirs and rivers the intake of boiled water, restrictive measures at water bodies and the setting up of a small automatic filtering unit with the pumping of water into disinfected containers made it possible to forestall the spread of cholera by water.

Cholera in Plains Areas of Dagestan

957A0854F Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 34-36

[Article by V. V. Kuchin, G. G. Onishchenko, I. Yu. Suchkov, M. B. Mishankin, V. E. Polosmakov, Ye. I. Yermenko, M. L. Lyakhover, M. Kh. Baygishiyev, V. N. Neklyayev, I. Ya. Cherepakina, S. N. Degtyareva and L. V. Guseva, Anti plague Scientific Research Institute, Rostov-na-Donu; Dagestan Republic State Sanitary and Epidemiological Oversight Center, Makhachkala; Anti plague Scientific Research Institute, Stavropol]

[FBIS Abstract] Babayutov'skiy Rayon is located in the plains region of Dagestan. There is constant visitation from other rayons due to the practice of transhumance, visits to relatives and for purchases and sales of food and other products, which contributes to spreading of the disease within the rayon and to other rayons. By 9 October 99 victims of cholera and 93 vibrio carriers had been registered in 10 populated places. The epidemic was caused by *V. cholerae* eltor, serovar Ogawa. An

analysis was made of the reasons for the appearance of major cholera foci in Babayurtovskiy Rayon (with spreading by the contact-household and food paths). The facilitating factors included the unsatisfactory living conditions for the population, extremely poor sanitation levels, widespread holding of ceremonial functions, ineffectiveness of measures intended to restrict migration of the population and the export of agricultural products from unfavorable regions, lack of training within the medical service for work under exceptional conditions, with a low level of qualification of local physicians, inadequacy or lack of efficacious prophylactic and therapeutic drugs. Antiepidemic measures were hindered by shortage of vehicles and gasoline and lack of telephone service to many populated places. Since transhumance is widely practiced, restriction of migration of the population is unrealistic. The spread of the disease to neighboring rayons is entirely probable because living and sanitation conditions remain unsatisfactory throughout the region and therefore epidemiological surveillance on a continuing basis is essential.

Features of Spread of Cholera and Antiepidemic Measures in Small Populated Places in Dagestan

957A0854G Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 36-39

[Article by A. N. Terentyev, Yu. M. Lomov, G. L. Karbyshev, D. G. Gasayev, B. P. Golubev, O. P. Fetsaylova, A. I. Bespalov, A. S. Tagirov, N. G. Ivanova and V. V. Pasyukov, Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] The work experience of a specialized antiepidemic team working in some rayons of Dagestan for the containment and elimination of cholera is analyzed and problems related to the improvement of anticholera measures is generalized. The properties of strains of cholera vibrios isolated from humans, including sensitivity to antibacterial preparations, were analyzed using computer processing with a FoxPro 2.5 data management system. It was possible to ascertain the origin and spread of the disease in each of the studied rayons. The epidemic process was characterized by an explosive character, scattering of foci among small populated places, predominance of contact-household transmission paths (strong contacts among family members and relatives) and a considerable lag in conducting anticholera measures, which was attributable to the suddenness in appearance of the outbreaks, remoteness of small populated places, shortage of personnel and resources at a given time and at a given place for conducting anticholera

measures and a lag on the part of local agencies in organizing an epidemiological analysis. However, this work, which in some cases was accompanied by aggressive prophylactic and therapeutic use of antibiotics, did help in alleviating the situation locally. Due to the lag in conducting these measures the infection spread both within the villages and through the rayon and republic as a whole. The epidemic process was complicated by the resistance of the strains of cholera vibrios circulating in these territories to antibiotics. All this gave rise to an unusual epidemic situation which dictated introduction of a series of special anticholera measures. References 5: 3 Russian, 2 Western.

Cholera in Remote Rayon of Dagestan

957A0854H Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 40-43

[Article by Yu. I. Arutyunov, A. A. Amirkhanov, M. M. Bazarganov, I. Ya. Cherepakhtina, V. N. Neklyayev and A. A. Omarova, Antiplague Scientific Research Institute, Rostov-na-Donu; Khasavyurt State Committee for Sanitary and Epidemiological Oversight Center]

[FBIS Abstract] The epidemic situation in a remote area of Dagestan, Khasavyurtovskiy Rayon, is examined in specific examples for the period of the cholera outbreak in the republic. The situation was complicated by the presence of 62,000 persons of Chechen nationality with strong family ties in Chechnya and constant visitation there and in neighboring rayons. A cholera threat comes from two directions: Chechnya and the internal rayons of Dagestan. An analysis is given for cases of the fully developed disease and carrying of the vibrio during the period 5 August-5 October 1994 (20 cases of cholera and 16 cases of carrying of the vibrio were studied). The epidemic lasted 62 days. The disease was initially imported from Babayurtovskiy Rayon. Individual case histories are examined in detail. A high percentage of the cases was traced to definite sources. The territorial and temporal separation of cases of the disease and carrying of the vibrio is indicative of periodic importation of the causative agent of cholera into the territory of Khasavyurt city and the rayon from other places unfavorable for cholera without water being involved as a path for transmission of the infection. The timeliness and completeness of implementation of antiepidemic measures (disinfections, large-scale examinations, restrictions on movement, dissemination of information among the population) did not allow the infection to assume the character of a well-developed epidemic.

Features of Cholera Epidemic Situation in Individual Rayon of Dagestan

957A0854I Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 44-45

[Article by V. V. Batashev, T. D. Yermolenko, A. S. Chernyavskaya, Ye. A. Bogdanov, M. M. Lyakhover, A. N. Abdusalamova and A. M. Makkayeva, Anti plague Scientific Research Institute, Rostov-na-Donu; Republic Center, State Committee for Sanitary and Epidemiological Oversight, Makhachkala; Untsukul'skiy Rayon Center, State Committee for Sanitary and Epidemiological Oversight]

[FBIS Abstract] The characteristics of the epidemic situation in Untsukul'skiy Rayon, which in ways was unique, are discussed. The first case was diagnosed on 18 July and the subject died five days later. This first death was an individual who had been on the hajj to Saudi Arabia and who shortly before the disease struck had visited other parts of the republic. The subject was buried without any precautionary measures being taken. About 300 persons, many from other villages, attended the accompanying solemnities. Food was distributed without adherence to sanitary rules. This began the spread of the epidemic. By 3 August there were 6 cholera diagnoses and 4 subjects had died. These deaths caused alarm among the population, resulting in extensive prophylactic use of antibiotics by the inhabitants of Untsukul and Shamil-kala villages. The infection was transmitted by the household-contact paths without water transmission. During the period July-late September a total of 25 victims and 103 vibrio carriers were registered, most of them in two above-mentioned populated places. The study revealed strains of the cholera vibrio with an atypical morphology. When determining sensitivity of strains of the cholera vibrio to antibiotics it was established that 79.3 percent of the cultures were resistant to tetracycline. This phenomenon can be attributed to the uncontrolled intake of antibiotics of the tetracycline series by the population. This probably also explains the in vivo formation of modified forms of the cholera vibrio, which made quite difficult the bacteriologic analysis and diagnosis of the disease.

Cholera in Makhachkala During 1994 Epidemic Period

957A0854J Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 46-50

[Article by S. M. Mamayeva, E. A. Moskvitina, G. G. Onishchenko, R. G. Adzhiyeva and A. M. Kokushkin,

State Committee for Sanitary and Epidemiological Oversight Center, Makhachkala; Anti plague Scientific Research Institute, Rostov-na-Donu; RF State Committee for Sanitary and Epidemiological Oversight, Moscow]

[FBIS Abstract] Fifty-one cholera victims and 27 vibrio carriers were detected in Makhachkala during the epidemic period. A considerable percentage (30.7 percent) of the cases were imported from regions unfavorable for cholera due to a well-expressed migration of the rural population into the city. The percentages of transmission paths were: contact-household — 44.3 percent, food — 28.4 percent, water — 14.9 percent (in Makhachkala 5.1 percent of the water samples failed to meet hygienic requirements and in adjacent settlements — up to 50-60 percent). The epidemiological process transpired listlessly and was drawn out in time. Massive affliction with the disease was prevented by a series of anticholera measures, among which the most important were restrictive and prophylactic measures directed to breaking the paths of transmission of V. cholerae. These included bans on large assemblies of the population, sea bathing, fishing and other forms of recreational water use and street sales of various food products. No one was allowed to leave the republic without being cleared by a bacteriologic examination. Although 13,000 departees were examined, only vibrio carrier was detected. However, importations of the disease were not fully prevented by restrictions, although they reduced the numbers by a factor of 7. The cholera prediction for Makhachkala remains unfavorable due to the possibility of new importations of infection from the outside. Figures 3; references: 4 Russian.

Paths of Cholera Spread in Mountainous Shamil'skiy Rayon in Dagestan

957A0854K Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 50-52

[Article by G. G. Onishchenko, Yu. G. Kireyev, V. V. Batashev, M. L. Lyakhover, M.-R. A. Rokhoyev, S. N. Chernyshev, B. M. Omarov, B. M. Asvarov and A. A. Kyuregyan, Anti plague Scientific Research Institute, Rostov-na-Donu; Dagestan State Committee for Sanitary and Epidemiological Oversight Center, Makhachkala]

[FBIS Abstract] The paths of cholera spread were analyzed for 273 victims of the disease and vibrio carriers during an outbreak in the mountainous Shamil'skiy Rayon during the period 18 July-4 September 1994. The disease was expressed in its severest form in Golotl, Rugelda, Khebda and Nizhnyaya Urada set-

lements which are in direct contact with the Avars-Koysu River, whose inhabitants in many cases use the water without purification and chlorination as drinking water or dump waste waters into this river. However, many of those who developed the infection were participants in a funeral banquet held in honor of a person who had died of cholera. It was found that the cholera was spread for the most part after banquets and visits of condolence with the distribution of food at such events (67.3 percent) and then by the contact-household (32.7 percent) path of transmission of the infection. Under conditions of absence of a centralized water supply in villages in the mountains and contamination of water in open water bodies by cholera vibrios, the remaining cases were transmitted by water, suggesting that in the future in addition to a series of regulatory measures it is advisable to make use of small water filtration units. The high incidence of disease propagation during funeral banquets and similar ceremonial occasions dictates that these functions be banned when cholera epidemic conditions prevail. Figure 1; references: 2 Russian.

Cholera Outbreak in One of Central Rayons of Dagestan

957A0854L Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 52-56

[Article by V. N. Savelyev, Ye. N. Belyayev, A. A. Monisov, A. A. Kyuregyan, G. M. Grizhebovskiy, V. I. Yefremenko, M. L. Lyakhov, B. M. Asvarov, A. M. Gamzayev, N. N. Golovchenko, V. A. Popov, N. I. Tikhonenko, S. M. Rudnev, G. P. Abgaryan, Yu. M. Yevchenko, V. M. Mezentsev and I. I. Onatskiy, Antiplague Scientific Research Institute, Stavropol; Antiplague Center, RF State Committee for Sanitary and Epidemiological Oversight, Moscow; Dagestan Antiplague Station; Republic State Committee for Sanitary and Epidemiological Oversight Center, Makhachkala; Rayon Center State Committee for Sanitary and Epidemiological Oversight, Kayakent]

[FBIS Abstract] Cholera has struck Dagestan repeatedly during the seventh pandemic, but the importation of cholera by pilgrims returning from Mecca in 1994 was the worst scenario, lasting over 5 months with more than 2,000 cases of cholera and vibrio carriers registered. Virtually the entire area of the republic experienced the epidemic. Data are cited from an epidemiological analysis of cases of cholera at the epicenter of the infection in Dagestan, specifically Gerga village in Kayakentskiy Rayon. The causative agent of the outbreak was V. cholerae eltor Ogawa, epidemic variant. The cholera outbreak was related to the arrival of a resident who had completed the hajj

to Saudi Arabia, a truck driver who had cared for an infected person during the return trip. Thereafter the principal path of transmission was contact-household. The infection was contracted in 10 households, affected by visits between their members and other infected parties. Many children were stricken. Public assemblies and ceremonies helped in spread of the disease, but the water transmission factor also was significant. There were two epidemic waves of cholera in Gerga village (June-October 1994). The introduction of epidemic control measures did not even begin until the second wave had started. From Gerga the infection was carried into other rayons of Dagestan. Figures 2; references: 4 Russian.

Epidemiology of Cholera in Derbentskiy Rayon in Dagestan. Paths of Cholera Importation and Spread

957A0854M Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 56-59

[Article by G. G. Onishchenko, A. K. Adamov, A. I. Kologorov, A. T. Yakovlev, Yu. M. Yevchenko, Sh. Z. Kadiyev, M. M. Seidova, Ye. V. Kuklev, G. M. Grizhebovskiy, V. M. Svistunov, V. V. Seroglazov, V. A. Popov, N. I. Pogasiy, S. D. Gavenskiy, N. S. Solodovnikov, B. I. Gamzayev, O. I. Taran, V. V. Sukhov and L. N. Velichko, RF State Committee for Sanitary and Epidemiological Oversight, Moscow; Mikrob Antiplague Scientific Research Institute, Saratov; Antiplague Scientific Research Institute, Volgograd; Derbent Center, RF State Committee for Sanitary and Epidemiological Oversight]

[FBIS Abstract] Cholera always afflicts Dagestan when the disease penetrates into the country from Iran. Each year tens of thousands of Iranians come to work in Dagestan from Iran, representing a constant threat that these will bring along the disease. However, in the epidemic of 1994 the disease was brought in by pilgrims returning from the hajj (10,000 residents of Dagestan made this pilgrimage in 1994). Details are presented on the course of the disease in the cities of Derbent and Dagestanskiye Ogni and rural populated places in Derbentskiy Rayon (a total of 23 cities and villages). The cholera epidemic in Derbentskiy Rayon was thus of an imported character. During the period from 26 June to 12 October there were 172 victims of cholera and 204 vibrio carriers. The severest cholera outbreaks were in Derbent city and Mamedkala and Morskoye villages. In Derbent, where the outbreak lasted 88 days, there was a precipitous increase in the number of infections from 19 June through 31 July. In rural villages and in Dagestanskiye Ogni the dynamics of infection with the cholera vibrio differed somewhat from that in Derbent,

peaking at a different time and lasting from 40 to 60 days. A high percentage of the population migrates both within the rayon and outside its borders. Restrictions on such migration were imposed only with a great delay, favoring spread of the disease. However, this spread also was favored by the assembly of large groups of people on various ceremonial occasions, accompanied by violation of the rules of personal hygiene. A special chart was constructed tracing the path of cholera spread through the rayon. Figures 2.

Epidemiology of Cholera in Derbentskiy Rayon. Characterization of Epidemic Process

957A0854N Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 60-64

[Article by G. G. Onishchenko, A. K. Adamov, A. I. Kologorov, A. T. Yakovlev, Yu. M. Yevchenko, Sh. Z. Kadiyev, M. M. Seidova, Ye. V. Kuklev, G. M. Grizhebovskiy, V. M. Svistunov, V. V. Seroglazov, V. A. Popov, N. I. Pogasiy, S. D. Gavenskiy, N. S. Solodovnikov, B. I. Gamzayev, O. I. Taran, V. V. Sukhov and L. N. Velichko, RF State Committee for Sanitary and Epidemiological Oversight; Mikrob Antiplague Scientific Research Institute, Saratov; Antiplague Scientific Research Institute, Volgograd; Derbent Center, RF State Committee for Sanitary and Epidemiological Oversight]

[FBIS Abstract] Affliction with cholera in Derbentskiy Rayon in the Dagestan Republic transpired primarily in a light and moderately severe form. The ratio between victims and vibrio carriers was 1:1.25. The etiologic agent of the epidemic was *V. cholerae* eltor, serovar Ogawa. In comparison with the vibrio carriers the victims of well-expressed cholera were of greater epidemiological significance as sources of infection. The infection of the population with cholera usually occurred by the contact-household path, less frequently via water. The highest index of infection with cholera vibrios was in the age group from 0 to 2 years. Neither the medical service nor the leadership of the republic were able to arouse public opinion concerning the seriousness of the threat and many people tried to evade restrictive measures. The medical service, suffering a serious shortage of funds, had difficulty in implementing antiepidemic measures. Despite suppression of the outbreaks and cleanup of the environment there is still no assurance that all sources of the causative agent, those with a light form of the disease and vibrio carriers, have been detected and eliminated. The proximity to Iran and Turkey makes a prediction of a cholera epidemic in 1995 unfavorable.

Cholera Epidemic in Some Mountainous Rayons in Dagestan Relative to Probable Role of Water Factor in Its Spread

957A0854O Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 64-69

[Article by G. G. Onishchenko, V. P. Toporkov, V. I. Prometnoy and A. V. Naumov, Mikrob Antiplague Scientific Research Institute, Saratov; Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] The cholera epidemic in Dagestan, appearing in June as a result of being brought in from abroad by pilgrims, continued in the mountainous rayons up to November. The dynamics of the cholera epidemic of 1994 was traced in three mountainous rayons (Gergebilskiy, Shamilskiy, Unsukulskiy) in Dagestan, joined by a system of rivers whose waters carried the vibrio. The situation in each of these rayons is discussed in detail because the nature of the outbreaks in each of them differed in a number of respects. In these rayons there were 537 cases of infection, constituting 1/4 of the total number of individuals afflicted by cholera in the republic. The probability of spread of cholera by water was attributable to the massive dissemination of *V. cholerae* in river, drinking and waste water from both from an active and a localized (intrahospital) epidemic focus. The vibrio escaped from the cholera hospital after discharge of intrahospital *V. cholerae* in waste water, contamination of river water and formation of secondary epidemic foci and waves of cholera, lengthening the infection in these rayons by more than 40 days. There were 7 epidemic waves in all. The water factor was particularly important due to the complete dependence of the population on the largest rivers for drinking water. These rivers had been strongly polluted by undecontaminated waste waters upstream from the sites of water intake and delivery of unchlorinated or inadequately chlorinated water to the population and the undervaluation of the danger of cholera infection via this path. Figures 2.

Spread of Cholera eltor in Two Widely Separated Rayons in Dagestan

957A0854P Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 69-71

[Article by A. N. Lobanov, S. D. Gavenskiy, V. V. Sukhov, A. T. Yakovlev, M. M. Kerimov and O. A. Kaplanov, Antiplague Scientific Research Institute, Volgograd]

[FBIS Abstract] The appearance of cholera in two widely separated rayons (Kislyarskiy and Karabu-

dakhentskiy) in Dagestan was investigated. The first case reported in the first of these was on 20 July, and in the latter on 19 August. In the first there were 18 cases of cholera and 8 vibrio carriers and in the second there were 51 cases of cholera and 84 vibrio carriers. In Gurbuki city, characterized by low sanitary standards and seriously affected by the epidemic (more than 50 percent of the cases in Karabudakhentskiy Rayon), difficulties in control were encountered because of the refusal of many to cooperate in bacteriological examinations, detected carriers refused to be hospitalized and ceremonial assemblies, common in this area, greatly favored contact transmission. The *V. cholerae* eltor outbreaks in these two rayons were imported from the outside and spread by the contact-household path; the disease was transmitted for the most part as a result of direct contact between infected persons and their relatives. Water played no part in the spread. There were common patterns of the appearance and course of the epidemiological process regardless of the place of appearance of the focus. A definite role in spread of the disease was played by uncontrolled migration of the population and participation of cholera victims and vibrio carriers in large get-togethers.

Features of Antibacterial Therapy for Cholera in Dagestan

957A0854Q *Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian* No 2, Mar-Apr 95 pp 71-74

[Article by G. L. Karbyshev, Yu. M. Lomov, A. N. Terentyev, O. P. Fetsaylova, B. P. Golubev, A. I. Bepalov, A. B. Mazrukho and N. G. Ivanova; Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] Traditional prophylactic and therapeutic agents for coping with cholera infection are mostly ineffective. The widespread prevalence of antibiotic-resistant strains of *Vibrio cholerae* makes essential a continuing study of the etiologic therapy of cholera. Data are given on the results of treatment of 428 individuals infected with *V. cholerae* (237 victims of cholera and 191 vibrio carriers) in different rayons of Dagestan during the cholera outbreak of 1994. The principal indicator of the efficacy of antibacterial therapy was a determination of the percentage of bacterial relapses. A study was made of the sensitivity of 119 strains of *V. cholerae* to different antibacterial preparations by the serial dilutions method. The collected data were subjected to computer analysis and a databank was organized. Tabulated

results are presented. With the clinical administration of levomycetin there was a 29.7 percent bacterial relapse rate and the stability of *V. cholerae* in vitro was 32-64 $\mu\text{g/ml}$. With the administration of tetracycline there was a 16.5 percent bacterial relapse rate with the same in vitro stability. The administration of a combination of these drugs gave a 15 percent bacterial relapse rate. Furazolidone gave a 4.3 percent bacterial relapse rate, but with use of ciprofloxacin there was a 2.8 percent relapse rate and an in vitro sensitivity 0.25-0.5 $\mu\text{g/ml}$. In the treatment of cholera patients it is recommended that ciprofloxacin be used, but that furazolidone be administered for vibrio carriers. References 6: 3 Russian, 3 Western.

Some Features of *Vibrio cholerae* Isolated in Dagestan 1994

957A0854R *Moscow ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII in Russian* No 2, Mar-Apr 95 pp 74-78

[Article by L. S. Podosinnikova, B. L. Mazrukho, Yu. M. Lomov, T. A. Khanumyan, L. G. Voronezhskaya, T. A. Kudryakova, L. D. Makedonova and A. V. Mironova; Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] A total of 492 strains of *V. cholerae* from two cities and 17 rayons in Dagestan were studied. All the strains were typical with respect to cultural-morphologic criteria and relation to diagnostic carbohydrates; they agglutinated with O1 serum, did not agglutinate with RO serum, belonged to the Ogawa serovar, were hemolysis-negative and resistant to polymyxin. It is shown that these strains, isolated in July-October 1994, are characterized by a high degree of resistance to cholera diagnostic phages and the carrying of the prophage characteristic for vct⁺ strains of *V. cholerae* eltor. There was a high percentage of resistance of the studied strains to tetracycline (65 percent) and levomycetin (28.6 percent) in 18 and 12 of the 19 rayons of Dagestan respectively. There also was a resistance of individual strains to furagin and erythromycin. There is a semiresistance of 163 of the 242 strains to a number of other antibacterial preparations. Gentamicin, ciprofloxacin and doxycycline were found to have high in vitro activity relative to the studied strains. Three tables summarize these findings rayon-by-rayon and an effort is made to interpret the areal differences. References 4: 3 Russian, 1 Western.

Phagolysing Properties of *Vibrio cholerae* Strains Isolated in Individual Rayons in Dagestan in 1994

957A0854S Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 78-80

[Article by Ye. S. Kazakova, Ye. G. Abramova, A. M. Makkayeva, O. I. Lukyanova, A. V. Naumov and A. K. Adamov, Antiplague Scientific Research Institute, Saratov; Dagestan Antiplague Station, Makhachkala]

[FBIS Abstract] One of the most important differential-diagnostic criteria in identifying representatives of *V. cholerae* and determining their virulence is the relation of cholera vibrios to diagnostic cholera bacteriophages. A study was made of 137 strains of *V. cholerae* isolated from cholera victims in July-September 1994 in 6 rayons in Dagestan. Research on the properties of the cholera vibrios isolated during this epidemic revealed that with respect to species properties they belong to typical *V. cholerae* Ogawa, but a high (67.2 percent) percentage of them are not lysed by diagnostic cholera bacteriophages. The studies were made using diagnostic agglutinating O-sera: O1 serogroups, Ogawa and Inaba; cholera bacteriophages C and Eltor; KhDF-3,4,5 bacteriophages. All 137 strains were typical in their cultural-morphologic, biochemical and serologic properties, but differed substantially relative to the C, Eltor and KhDF-3,4,5 phages (a product of the Mikrob enterprise). Data on the phagolysing properties of cholera vibrios at the time of their isolation and 3 months thereafter are summarized in tables. With their storage for 3 months their sensitivity to cholera bacteriophages did not change significantly. These experiments with different series of diagnostic cholera bacteriophages indicate the need for their further improvement. References: 7 Russian.

Preservation of *Vibrio cholerae* in Water Sources in Central Rayons of Dagestan (Experimental Data)

957A0854T Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 80-83

[Article by B. P. Golubev, Yu. M. Lomov, A. N. Terentyev, G. L. Karbyshev, A. B. Mazrukho, A. I. Bespalov, A. S. Tagirov, O. P. Fetsaylova, L. V. Ivanova, V. N. Kozlovskiy, L. M. Verkina and O. S. Burlakova, Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] In the studied area there were 193 cholera victims or vibrio carriers. After reviewing the literature on the preservation of the cholera vibrio in different water media under various conditions, it is concluded that the acidic pH of surface water bodies in Izberbash city, including sea water, and in the two rayons adjacent to it, in all probability does not favor

prolonged preservation of *Vibrio cholerae* eltor, but additional ecologic research is required for study of the possible taking root of the infection. However, water from the Zam-Zam spring brought back by hajj pilgrims, being contaminated by *V. cholerae*, may have served as a factor in transmission of the infection, although the duration of its effect is limited by the times of survival of *V. cholerae*. Otherwise the water path of transmission of the infection played no significant role in the spread of cholera in Izberbash city and the two rayons in Dagestan adjacent to it (it accounted for about 3.9 percent). The antiquated water system, in very poor repair, was not found to be a source of infection. A total of 1,062 tap water samples were negative. Sea water was constantly sampled, since large quantities of raw sewage were dumped into it daily, but all tests were negative. Although 30 percent of the population uses well water, all pertinent tests were negative. In nearby Karabudakhkentskiy and Sergokalinskiy Rayons the water path of transmission was almost insignificant. Figure 1; references 12: 9 Russian, 3 Western.

Properties of *Vibrio cholerae* Isolated in Large Rayons in Western Dagestan in 1994

957A0854U Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 84-86

[Article by I. Ya. Cherepakina, Yu. M. Lomov, A. V. Karagozova, O. I. Pomukhina, L. M. Smolkova, L. D. Makedonova, N. I. Dimitrova, V. N. Neklyayev, V. V. Balakhnova and O. O. Chirkova, Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] A study was made of 185 cultures of cholera vibrios isolated by a specialized antiepidemic team of the Rostov Antiplague Institute in August-October 1994 in Khasavyurtovskiy, Babayurtovskiy and Novolakskiy Rayons in Dagestan. Cultures from the three rayons were compared. Samples originated from various hospitals, examinations of selected groups, individuals departing the republic and environmental objects. The presence of antidermonecrotic antibodies also was ascertained. All the isolated strains were typical with respect to morphologic and cultural properties and could be agglutinated (except for one strain) to the titer or half-titer with the diagnostic cholera O serum and the Ogawa serum. Four strains bore evidence of RO dissociation and 4 strains agglutinated in a low titer with Inaba serum. All the strains were resistant to diagnostic bacteriophages. Cyproxin and doxycycline were the most active agents in the treatment of victims. Agglutinins, vibriocidins and antidermonecrotic antibodies were detected in diagnostic titers in the sera of all patients and vibrio carriers. The results of these analyses are tabulated. References: 2 Russian.

Outer Membranes of Cholera Vibrio as Potential Component of Chemical Vaccine

957A0854V Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 86-89

[Article by Ye. Yu. N'arkov, L. Ya. Urbanovich, Ye. P. Golubinskiy, A. B. Chernov, E. S. Karetnikova, T. A. Ivanova and N. A. Pakulev, Irkutsk Antiplague Scientific Research Institute of Siberia and the Far East]

[FBIS Abstract] The protective properties, antigenic activity and toxicity of preparations from the outer membranes of *V. cholerae* eltor are described on the basis of experiments with laboratory animals (mice, rabbits). The *V. cholerae* eltor membrane preparations were obtained by lysis and simultaneous inactivation of the microbial cells by urea (rather than formalin or phenol, which reduce their immunogenicity), with subsequent differential centrifuging and nuclease processing. The membrane sources used in the work were strains of *V. cholerae* eltor M-878 (Inaba serovar) and P-3116 (Ogawa serovar). The animal tests are described in detail. The results with both mice and rabbits were highly encouraging: immunity was significantly enhanced. It was established that the outer membrane preparations with parenteral and per os administration induced in the mice a well-expressed immunity to experimental cholera infection and the production of vibriocidal antibodies in high titers. The treatment of *V. cholerae* membranes with trypsin results in a further increase in immunogenicity of the preparation. The protective effect of the outer membranes of *V. cholerae* eltor considerably exceeds that of the corpuscular eltor vaccine currently used in practical work. These outer membranes are potentially suitable for improving a chemical cholera vaccine as a component ensuring the formation of antibacterial immunity. References 14: 8 Russian, 6 Western.

Discovery of Dermonecrotic Factor in Vibrio cholerae Non O1 and Other Pathogenic Vibrios

957A0854X Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 93-94

[Article by O. I. Pomukhina, V. S. Uraleva, O. I. Salnikova and G. T. Atarova, Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] The dermonecrotic (DNF) factor in the causative agent of cholera is highly toxic. An effort was made to detect DNF activity by vibrios of other taxonomic groups. A study was made of 25 strains of *V. cholerae* non O1 isolated from humans with gastroenteritis, but also *V. alginolyticus*, *V. parahaemolyticus*, *V. albensis*, *V. mimicus*, *V. fluvialis*, *V. vulnificus* and

V. damsela, a total of 51 strains. DNF was accumulated by cultivating the vibrios for 3 days in 3 percent peptone water pH 7.6. The DNF was discovered in virtually all strains of the studied vibrios and there was an antigenic affinity with one another and with the DNF of *V. cholerae* O1. The capacity to produce the DNF was determined in a skin test on rabbits. Three toxin-neutralizing sera were produced. All the developed sera caused total neutralization of the DNF in the skin test, although this was to some degree dependent on the diameter of the necrotic zone, which averaged 5-10 mm; there was only partial neutralization for larger areas. The general toxic effect of DNF was studied in white mice using supernatants of 5 strains of *V. cholerae*, 1 strain of *V. damsela* and 1 strain of *V. vulnificus*. The material was administered intraperitoneally in volumes 0.2 and 1.0 ml. After 2-5 days only 15 percent of the animals had survived.

Cases of Intrahospital Cholera Infection

957A0854Y Moscow *ZHURNAL MIKROBIOLOGII, EPIDEMIOLOGII I IMMUNOBIOLOGII* in Russian No 2, Mar-Apr 95 pp 96-97

[Article by G. L. Karbyshev, Yu. M. Lomov, B. P. Golubev and A. N. Terentyev, Antiplague Scientific Research Institute, Rostov-na-Donu]

[FBIS Abstract] During the initial period of development of the cholera epidemic in Izberbash in the Dagestan Republic an unfortunate occurrence was the formation of a focus of intrahospital cholera infection in the infectious diseases department of the city hospital. The first cases of intrahospital infection of healthy persons with cholera appeared during the period 3 August-5 August 1994. Three specific cases are described. The initial patient (who died) was attended by two relatives who had had no recent contact with one another prior to coming to the hospital. Both these persons were later diagnosed with the cholera vibrio, evidence that they had been infected in the hospital. In another case at the same time another individual with a severe case of cholera was admitted and was cared for by a relative. In this case as well a culture of the cholera vibrio was isolated from the latter with evidence that the infection had occurred in the hospital environment. A third patient, the son of the mentioned deceased patient, evidently was infected in a family setting, but upon admission to the hospital was successfully treated with tetracycline, but then suffered a relapse, evidently due to reexposure in the hospital. These and other cases are attributable to the fact that in the infectious diseases department up to 10 August there was a failure to adhere to proper disinfection procedures and the cholera patients were attended by relatives. There also were other significant violations

of antiepidemic operations in the hospital which began to adhere to proper rules only two weeks after its opening, after which no such cases occurred.

Effect of Selected Trichothecenic Mycotoxins on Carotenoid Synthesis in *Rhodotorula glutinis*

957A0855A Moscow MIKROBIOLOGICHNYY
ZHURNAL in Russian Mar 95 Vol 21 No 3, pp 24-30

[Article by L.M. Kirillova and A.M. Zaychenko, Microbiology and Virology Institute, Ukraine National Academy of Sciences, Kiev; manuscript received 1 Jun 93; UDC 582.288]

[FBIS Abstract] A study examined the effect of selected macrocyclic trichothecenic mycotoxins of the strains *Rhodotorula glutinis* 1235 and 1233 on carotenoid synthesis. The yeasts were cultured at 25 and 30°C as described elsewhere. Preparations of the following were also used in the experiments: verrucarins A, T-2 toxin, patulin, trichothecin, desoxynivalenol, sorbic acid, roridine H, and dendrodochin. A partially purified complex dendrodochin preparation that was established to contain the following components was used in addition to the individual mycotoxins: verrucarins A, 63.48; roridine A, 1.7; roridine H, 15.4; and other macrocyclic trichothecenic fungi, 14.42. All of the mycotoxins were used in the form of alcohol solutions with the end concentration of alcohol in the study system not exceeding 1 percent. A complex system of solvents, i.e., a 10:7:7:6 mixture of n-hexane, acetone, toluene, and absolute alcohol, was used to extract the carotenoids from the cells. The carotenoids were subjected to thin-layer chromatography, spectrophotometric analysis, and quantitative estimation. The various toxins stimulated carotenoid synthesis and thus increased total carotenoid yield by the following amounts: toxin T-2, 60-70 percent; dendrodochin, 50 percent; roridine H, 30-40 percent; and verrucarins A, 30-40 percent. Trichothecin and desoxynivalenol had only a slight stimulating effect on carotenoid synthesis (5-20 percent). In a dose of 1.0-1.4 µg/ml, T-2 toxin increased the total carotenoid yield of the resistant strain by 60 percent, whereas doses of 0.150-0.500 µg/ml did not produce any noticeable stimulating effect. The macrocyclic trichothecenic fungus roridine H stimulated carotenoid synthesis by the said strain by 30-40 percent, while verrucarins A proved less active. The class B trichothecenic fungi and desoxynivalenol had a much lesser effect, only stimulating carotenoid synthesis by 5-20 percent. The nontrichothecenic fungus patulin inhibited carotenoid synthesis. When sorbic acid was added to the culture medium in amounts of 0.004, 0.008, and 0.012 percent, the total amount of carotenoids synthesized by strain 1235 increased by 16, 26, and 30 percent, respectively. Adding

the same amounts of sorbic acid to the culture medium did not have any effect on carotenoid synthesis by the strain 1233. When zinc ions were added to the culture medium in a concentration of 0.5 percent, total carotenoid synthesis by the strain 1235 decreased by half, whereas adding manganese ions in a concentration of 1 percent caused a threefold decrease in the level of carotenoid synthesis. The mycotoxins studied also changed the component profile of the carotenoid complex. Adding the study macrocyclic trichothecenic mycotoxins to the medium tended to increase the number of components in the complex, whereas adding patulin reduced the number of components. Possible mechanisms of the stimulating effect of trichothecenic mycotoxins were discussed. Figures 4; references 15: 7 Russian, 8 Western.

Geobotanic Indication of Anthropogenic Pollution of Streams

957A0775A Yekaterinburg EKOLOGIYA
in Russian No 2, Mar-Apr 95 (manuscript received
2 Nov 93) pp 99-102

[Article by K. M. Rudakov, Semipalatinsk Affiliate, Republic Scientific Research Ecologic Center; UDC 577.472+551.493]

[FBIS Abstract] The possibilities of using the geobotanic indication method for determining the pollution level in rivers was explored. Fourteen streams in the Belaya River basin in the Ural were studied in July 1992-1993 involving 490 geobotanic descriptions of bank vegetation; due to silting 6 of these no longer reach the water bodies into which they had earlier discharged. The studied streams differed in composition of pollutants, but this was not a significant consideration. Two distinct plant associations were defined, the first indicative that the waters are unpolluted, the second indicative of anthropogenic pollution. Seven streams were found to be polluted by industrial and communal waste, five were polluted by agricultural agents and two exhibited ground water pollution caused by drilling work. The means by which this discrimination was made are discussed. It is noted that in streams the results of pollution studies are far more indicative than for large rivers due to the much greater dilution in the latter. Nevertheless, only two gradations could be defined for streams: polluted and unpolluted. However, the geobotanic indication method can be used not only for estimating the degree of pollution of the streams themselves, but also for estimating the intensity of the anthropogenic impact on the area of their drainage basins (pollution of soil and ground water, intensity of soil erosion). The method can be applied successfully for large-scale mapping of many-sided anthropogenic impact over extensive territories. References: 13 Russian.

State of Radio Nuclides in Soils of East Ural Radioactive Trace

957A0775B Yekaterinburg *EKOLOGIYA in Russian*
No 2, Mar-Apr 95 (manuscript received 1 Jun 94)
pp 110-113

[Article by V. V. Martyushov, D. A. Spirin, V. V. Bazylev, T. A. Fedorova, V. Z. Martyushov and L. A. Panova, PO Mayak, Chelyabinsk-65; UDC 631.43:539.16]

[FBIS Abstract] Data are given on the distribution of long-lived radio nuclides in the layer 0-30 cm of different types of soils contaminated as a result of the accident in the Southern Ural in 1957. The forms of state and the quantities of radio nuclides in the soils were examined in detail along the so-called East Ural radioactive track (EURT), along which there is a great diversity of soil and climatic conditions. It was established that 36 years after the accident in all types of soils along the EURT most of the radio nuclides (more than 70 percent of those in the layer 0-30 cm) are concentrated in the upper layer 0-20 cm. The greatest capacity for migration is exhibited by ^{90}Sr and the least by Pu. The greatest migration of radio nuclides is observed in peaty-swampy soils characterized by a high moisture content. Depending on the type of soils, the contents of water-soluble forms of ^{137}Cs , ^{90}Sr and Pu are 0.03-0.2, 1.2-2.9 and 0.2-0.5 percent respectively. In the composition of water-soluble forms in meadow-chernozem soil ^{137}Cs and Pu are predominantly in the composition of anion complexes (80 percent) and ^{90}Sr in cation complexes (76 percent). About 20 percent of the ^{90}Sr is in neutral complexes. Exchange forms of ^{137}Cs , ^{90}Sr and Pu, depending on the type of soils, amount to 0.4-2.87, 23.4-58.0 and 0.3-0.8 percent of the gross content. The quantities of acid-soluble forms of radio nuclides are comparable with the exchange forms and for ^{137}Cs , ^{90}Sr and Pu are 0.4-2.9, 26.0-73.6 and 1.2-3.8 percent respectively. The content of fixed forms of ^{137}Cs and Pu attains values 95-98 percent of the gross level. For ^{90}Sr this quantity is considerably less (1-34 percent), which indicates its higher capacity for migration. The quantity of bound forms in meadow-chernozem soil for ^{137}Cs , ^{90}Sr and Pu falls in the range 26, 7, 95 percent of the gross content respectively. In the composition of the bound forms a high percentage of the ^{137}Cs (up to 70 percent) is sorbed by sesquioxides and Pu (up to 73

percent) is sorbed by organic soil matter. Fifty percent of the ^{90}Sr is bound by amorphous silicic acid and 50 percent by organic soil substances. Figure 1; references: 10 Russian.

Possibility of Perception of Acoustic Noise of Gas Pipelines by Fish

957A0775C Yekaterinburg *EKOLOGIYA*
No 2, Mar-Apr 95 (manuscript received 2 Jun 93)
pp 114-118

[Article by B. M. Basov, V. V. Moiseyev and A. A. Orlov, Institute of Experimental Morphology and Evolution of Animals imeni A. N. Severtsov, Russian Academy of Sciences; Central Scientific Research Institute imeni A. N. Krylov, St. Petersburg; UDC 504.054]

[FBIS Abstract] A clarification was sought for the possible influence of the acoustic noise generated by gas pipelines on the behavior of fish. A study was made of the levels of acoustic pressure and the spectral composition of noise in zones where gas pipelines cross rivers. Hydroacoustic sounding also was carried out. The work was done at the headwaters of the Ob in May 1991. The literature contains very little information on the response of fish to acoustic sources of artificial origin. It was found that the noise levels considerably exceed the levels of threshold sensitivity of the acoustic-lateral system in fish, but in no case are adequate for traumatizing or killing fish. The different sensitivities of different species of fish are discussed. Acoustic noise which is stationary in time probably results in a rapid adaptation of fish. Under such conditions in the neighborhood of pipelines where there is mass migration there will be brief concentrations of fish (during the period of their adaptation) which then with some latent period will overcome the created barrier. This conclusion is confirmed by echo sounding data revealing the absence of stationary concentrations of fish prior to zones with increased acoustic noise. Near the air-water interface the acoustic pressure level will tend to zero and therefore bottom-migrating fish may detour into the upper horizons and the near-surface layer where the intensity of the acoustic field is substantially less. For pelagic fish low levels of acoustic noise will not constitute a serious obstacle for migration. Figures 3; references 13: 4 Russian, 9 Western.

Mussels Acidic Hydrozylate (MIGI-K Preparation) and Its Biological Action

957A0720A Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 115 No 2, Mar-Apr 95 pp 213-224

[Article by Ye.N. Goncharenko, L.I. Deyev, Yu.B. Kudryashov, and I.M. Parkhomenko, Moscow State University imeni M.V. Lomonosov; UDC 597.391.591:615.771.8]

[FBIS Abstract] Review article. MIGI-K is a mussel acidic hydrozylate which is obtained from the bivalve *Mytilus galloprovincialis*. At 20° one mussel 5-6 cm long filters more than 3 liters of seawater per hour. It suctions and concentrates microelements and mineral and organic substances. MIGI-K is very susceptible to industrial wastes and can be used as an indicator of the purity of seawater. It is eurythermal and is strongly heated by direct sunlight but survives temperatures in the Arctic. Its average lifetime is 13-15 years; the giant forms survive for up to 20 years. It is abundant in the Pacific Ocean from the tropics to the Arctic and Antarctica, and can be raised on farms. One hundred g of MIGI-K can be obtained from 1 kg of mussel.

The antiradiation action of the preparation depends on the degree of acidic hydrolysis. The meat of untreated mussel in the best case gave 20 percent protection from a radiation dose of 6 gram-roentgens; after a medium degree of hydrolysis, the survival rate was 35 percent, and after complete hydrolysis was 55 percent [test animal not indicated]. The Nutrition Institute of the USSR established that the meat of the mussels increases the removal of cholesterol from the organism. Acid hydrolysis not only retains the biological value of the initial raw material but increases the resistance of the organism to extremal effects. All the unsubstituted amino acids except tryptophan exist in MIGI-K. Attention has been paid particularly to taurine. One advantage of MIGI-K is its lack of toxicity. It has no mutagenic effects and is promising as an agent for treating cancer as well as preventing radiation damage.

References: 19 Russian, 17 Western.

Analysis of Some Clinical and Immunological Phenomena in the Context of the Proposed Model of T-Helper Antigen-Identifying Complex

957A0720B Moscow USPEKHI SOVREMENNOY BIOLOGII in Russian Vol 115 No 2, Mar-Apr 95 pp 225-237

[Article by Yu.L. Volyanskiy, G.L. Telepneva, and N.V. Vasilyev, Kharkov Research Institute of Microbiology and Immunology imeni I.I. Mechnikov; UDC 577.27:575]

[FBIS Abstract] A model of the structure of the HIV target receptor apparatus is proposed. The models re-

ported in the literature are reviewed, and the authors present a representation of the antigen-recognizing T-helper complex. It has been established that antigen-recognizing T-cell receptors of different animal species are homologous glycoprotein immunoglobulins which form two antigens — T-cell receptors and CD3. The authors proposed a representation of the chains of the receptors according to which the CD3 antigen does not contain ξ - and η -chains. This model makes it possible to explain the variability of T-receptor cells, including the whole spectrum immunoglobulin. The models explain the following phenomena: 1) The possibility of the reaction of Langerhans and T-killer cells with the activation of HIV; 2) the ability of the T-lymphocyte to recognize a superantigen; 3) the necessity for activation of a signal involving the Ia-receptor of the T-cell and a signal passing through the antigen-specific receptor of the T-killer cell; 4) the existence of two "interval" rules of the development of the immune response; 5) the massive "throwing off" of the receptors (R-proteins) from the cell membrane surface under infection conditions (especially virus diseases, including AIDS); 6) the fatal inevitability of the formation of "defective immunopathological circles" which play a key role in the pathogenesis of AIDS. (Figures 5; References: 16 Russian, 35 Western.)

Influence of Immobilization in Hydrogel Granules on Structural-Functional Characteristics of Hybrid Cells in Cultivation Process

957A0755A Moscow BIOLOGICHESKIYE MEMBRANY in Russian Vol 12 No 2, Mar-Apr 95 (manuscript received 11 May 94) pp 122-128

[Article by Ye. A. Markvicheva, S. V. Khaydukov, T. Yu. Mareyeva, A. S. Bronin, V. A. Nesmeyanov and V. P. Zubov, Bioorganic Chemistry Institute imeni M. M. Shemyakin and Yu. A. Ovchinnikov, Russian Academy of Sciences; UDC 57.086.833.6]

[FBIS Abstract] Some characteristics of gel-entrapped hybridoma cells, such as cell size, membrane immunoglobulin expression and DNA content, were studied by flow cytometry and compared to those of a freely suspended culture. It was found that the studied immune culture could contain anomalously large cells which could play the role of a highly productive population. On the seventh day of cultivation the immune culture cells were freed of granules and subjected to sterile sorting, making it possible to select three cell populations differing in size and granularity of the cytoplasm. This represented a first attempt at sterile sorting of immune culture cells for clarifying the contribution of individual immune culture cell populations to the total production of monoclonal antibodies. Cells in the first popula-

tion continued normal division and production of monoclonal antibodies, but those in the second and third populations did not divide and did not secrete monoclonal antibodies. Thus, during cultivation of cells in Ca-alginate granules there were irreversible structural-functional changes in some of the cells, the explanation for which requires further study. The entrapment of the cells in gel granules was found to result in an increase in cell size, which correlated with the DNA content and enhancement of membrane immunoglobulin expression. The cell cycle analyses of the entrapped cells and the freely suspended cells, based on DNA histograms, were quite different. In general, despite changes in cell structure the entrapped cells retained a high viability and produced monoclonal antibodies during the cultivation period. Figures 6; references 19: 7 Russian, 12 Western.

Influence of Products of Hydrolysis of Lipids on Activity of Phospholipase A₂ in Lipid Monolayer

957A0755B Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 12 No 2, Mar-Apr 95
(manuscript received 29 Jun 93) pp 165-173

[Article by V. M. Mirskiy, Electrochemistry Institute imeni A. N. Frumkin, Russian Academy of Sciences; UDC 577.3]

[FBIS Abstract] The lauric acid and lysolauroyllecithin effects on lipid monolayer hydrolysis by phospholipase A₂ from bee venom were studied. The lysolauroyllecithin inhibits phospholipase action at high (39 mN/m) as well as low (25 mN/m) surface pressures. The lauric acid inhibits phospholipase action at low surface pressure (15 mN/m or 25 mN/m), but activates the enzyme at high surface pressure (39 mN/m). The activation can be suppressed by increasing the ionic strength of the aqueous phase. A simple physical model is constructed which takes into account the redistribution of phospholipase in the electric field generated by the products of lipolysis and which makes possible a quantitative description of activation of the enzyme by fatty acids and the induction period. The model describes an electrostatic mechanism of phospholipase activation which reveals that the discovered phospholipase activity is associated with additional adsorption of the enzyme and an increase in the near-membrane concentration of calcium ions due to an increase in the negative charge on the membrane surface during the formation of fatty acids. The kinetic curves of hydrolysis of the lipid monolayer are computed with this effect taken into account. The redistribution of enzyme molecules and calcium ions

in the electric field of the hydrolysis products occurs during functioning of the phospholipases on the surface of an organized substrate and therefore the considered mechanism can serve as a basis for the substrate activation of lipolysis. The experiments were carried out using a Langmuir tank developed at the Max Planck Institute of Biophysical Chemistry at Göttingen, Germany. Figures 6; references 21: 1 Russian, 20 Western.

Research on Interaction Between Cholera Toxin and Its B-Subunit With Liposomes Containing GM1 Ganglioside and Fluorescent-Labeled Gangliosides

957A0755C Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 12, No 2, Mar-Apr 95
(manuscript received 9 Mar 94) pp 174-184

[Article by O. N. Smirnov, A. M. Surin and Ye. I. Astashkin, AO Biokhimiya, and I. I. Mikhalev and Yul. G. Molotovskiy, Bioorganic Chemistry Institute imeni M. M. Shemyakin and Yu. A. Ovchinnikov, Russian Academy of Sciences; UDC 577.336:577.352.336]

[FBIS Abstract] Binding of cholera toxin (CT) to liposomes doped with GM1 ganglioside or its fluorescent-labeled analogues bearing antrylvinyl (AGM1) or perylenoyl (PGM1) fluorophore at the end of the fatty acid moiety was studied. The parameters of newly observed CT fluorescence and the ganglioside probe emission indicated that CT interaction with liposomes induces changes in the environment of tryptophan residues similar to those induced by B-subunit (BCT) interaction with GM1-doped liposomes. On the basis of these data, the stoichiometry and the dissociation constant of GM1, AGM1 and PGM1 were determined. The fluorophore appeared not to interfere with the binding of probes to the CT. CT or BCT binding with ganglioside-bearing liposomes increased anisotropy of the antrylvinyl fluorescence to the same degree (20-25 percent) and did not change the appearance of the perylenoyl emission spectrum. It is postulated on the basis of these data that CT and BCT did not disturb the hydrophobic region of the phospholipid bilayer. During CT interaction with the GM1-doped bilayer ACT (A-subunit) appeared not to be located in the hydrophobic membrane region and it is therefore surmised that at the moment of CT binding with the liposomal membrane the ACT is positioned over the B-subunit. Figures 6; references 36: 10 Russian, 26 Western.

Role of Fe²⁺ in Peroxidation of Lipids in Liposomal Membranes Induced by Sodium Hypochlorite

957A0755D Moscow BIOLOGICHESKIYE
MEMBRANY in Russian Vol 12 No 2 Mar-Apr 94
(manuscript received 21 Apr 93) pp 191-199

[Article by O. M. Panasenko, S. A. Yevgina, Ye. S. Dremina, V. S. Sharov, V. I. Sergiyenko and Yu. A. Vladimirov, Physical Chemistry Medicine Scientific Research Institute; UDC 577.334]

[FBIS Abstract] The participation of Fe²⁺ ions in sodium hypochlorite-induced lipid peroxidation (LPO) was investigated by the chemiluminescence (CL) method. The addition of Fe²⁺ to an aqueous solution of NaOCl was found to be accompanied by a CL burst similar to the well-known reaction during which HO radicals, being potential inducers of free radical processes, are formed. However, with the addition of phospholipid liposomes to this system the OCl⁻ + Fe²⁺ reaction did not play an appreciable role in the inducing of LPO of liposomal membranes in comparison with the LPO induced by this same Fe²⁺ quantity in the absence of OCl⁻. Nevertheless, preincubation of liposomes with OCl⁻ yielded a considerable LPO product accumulation increasing with an increase in the OCl⁻ concentration and with an increase in incubation time. The subsequent addition of Fe²⁺ was followed by an increased CL burst indicating that Fe²⁺ ions converted OCl⁻-induced LPO products into free radical intermediates initiating new LPO chains. It is concluded that the reaction of Fe²⁺ with primary LPO products ("chain branching" reaction) plays an important role in OCl⁻-induced LPO. Figures 7; references 22: 10 Russian, 12 Western.

Role of the Endogenous Opioid System in Mechanisms of the Development of Early Postirradiation Vegetative and Behavioral Impairments

957A0741A Moscow RADIATIONNAYA BIOLOGIYA
RADIOEKOLOGIYA in Russian Vol 35 No 2,
Mar-Apr 95 pp 195-199

[Article by V.I. Legeza, M.G. Shagoyan, A.N. Panov, N.I. Pshenkina, L.V. Buryakova, and Yu.S. Turlakov, Military Medicine Scientific Research Institute, Russian Federation Ministry of Defense, St. Petersburg; manuscript received 29 Jul 94; UDC 599-9.05:539.1.047]

[FBIS Abstract] The dynamics of early postirradiation changes in the level of opioid peptides in the blood plasma and brain structures was studied in experiments performed on 22 male dogs weighing 12-18 kg each and on 168 male white rats weighing 170-230 g each. The animals were subjected to uniform total-body irradiation (from a ¹³⁷Cs source) at a dose rate

of 0.03 Gy/s. The dogs received a dose of 50 Gy, and the rats received a dose of 100 Gy. Their levels of opioid peptide (β -endorphin in the blood plasma of the rats and dogs and Leu- and Met-enkephalins in the various structures of the rats' brains) were studied by radioimmunoassay 15, 60, and 180 minutes after the animals had been irradiated. Fifteen minutes after the rats had been irradiated, the Met-enkephalin levels in rat medulla oblongata increased to nearly 70 percent over their initial levels, whereas those in the rat hypothalamus and caudate nucleus increased by 25 percent. The β -endorphin levels in the rats' and dogs' blood plasma were also elevated 15 minutes after the radiation session. In both the dogs and rats, β -endorphin levels peaked 1 hour after they had been irradiated. Three hours after the irradiation sessions, endorphinemia remained extremely pronounced in both the rats and dogs. Radiation was therefore concluded to have an activating effect on the endogenous opioid system. The said conclusion is consistent with data in the literature. Unlike some published studies, however, the present study did not indicate that administration of anesthesia before irradiation prevents postirradiation shifts in β -endorphin levels. Administration of the opioid receptor naloxone to the dogs in a dose of 0.5 mg/kg promoted a decrease in postirradiation vomiting. Naloxone also promoted decreases in postirradiation gastroparesis and hypokinesia in the rats. These findings were interpreted as evidence supporting participation of the endogenous opioid system in the primary clinical response to irradiation. Figures 3, tables 2; references 15: 9 Russian, 6 Western.

Radioprotective and Interferonogenic Properties of Influenza Vaccine

957A0741B Moscow RADIATIONNAYA BIOLOGIYA
RADIOEKOLOGIYA in Russian Vol 35 No 2,
Mar-Apr 95 pp 231-236

[Article by A.A. Ivanov, F.I. Yershov, A.M. Ulanova, T.D. Kuzmina, N.M. Stavrikova, E.B. Tazulakhova, and G.A. Shalnova, Biophysics Institute, Russian Federation Ministry of Health, Moscow, and Epidemiology and Microbiology Institute imeni Gamaleya, Russian Academy of Medical Sciences; manuscript received 6 May 93; UDC 599:539.1.047]

[FBIS Abstract] The possibility that influenza vaccine has a radioprotective effect and the link between this possible radioprotective effect and the interferon activity of influenza vaccine were explored in a series of experiments performed on the following laboratory ani-

imals: 1,298 CBAx57B1 (*F*₁) mice (both males and females) weighing 20-21 g each; 200 hamsters weighing 70 g each, and eight nonpedigree dogs weighing 13-15 kg each. The mice and hamsters were irradiated on an IGUR unit with γ -quanta of ¹³⁷Cs (dose rate, 168 Gy/min), and the dogs were irradiated on an EGO-2 unit with γ -quanta of ⁶⁰Co (dose rate, 0.20 Gy/min). The animals were irradiated in the following doses: mice, 7.1 and 8.2 Gy (LD_{75-100/30}); hamsters, 8.2 Gy (LD_{100/30}); and dogs, 3.65 Gy (LD_{95-100/45}). Series 38 inactivated influenza vaccine (produced by the Omutninsk Chemical Plant) was injected into the laboratory animals as a radioprotective agent as follows: the mice received 0.2-ml subcutaneous or 0.05-ml intravenous injections 1-7, 14, or 30 days before being irradiated; the hamsters received 0.2-ml subcutaneous injections 1, 2, 5, or 7 days before being irradiated; and the dogs received 0.3-ml injections 1 or 5 days before the irradiation sessions. Control animals of each type (i.e., animals that were irradiated but did not receive any influenza vaccine) were also studied. In addition, the effects of influenza vaccine on interferon production were studied in 160 mice that were not irradiated. The experiments confirmed that influenza vaccine does indeed have a pronounced radioprotective effect when administered prophylactically. The survival rates of the animals that were irradiated after having been injected with influenza vaccine were 25-55 percent higher than the those of the control animals. The radioprotective effects of influenza vaccine were most evident in mice irradiated in a dose of 7.1 Gy regardless of whether they had received the influenza vaccine via subcutaneous or intravenous injection. In the hamster experiments, those animals that were injected with influenza vaccine 2 days before being irradiated survived irradiation at a rate 40 percent higher than their control counterparts did. Administration of influenza vaccine 1 day after irradiation had no positive impact on survival. Of the eight dogs studied, the two controls died (on days 15 and 17 following irradiation, respectively), one of the three dogs injected with influenza vaccine 5 days before being irradiated survived, and one of the three dogs injected with influenza vaccine 1 day before being irradiated died. The four experimental dogs that died all died on days 15-17 after having been irradiated. Fewer changes in clinical-hematologic indicators were noted in the dogs infected with influenza vaccine 5 days before irradiation than in those dogs infected 1 day before irradiation. Immunization with influenza vaccine was concluded to provide a short-term (1-7 days) boost in radiation resistance. The said period of elevated radiation resistance coincided with the period during which the blood levels of interferon in the mice injected with influenza vaccine were at their peak. Figures 2, tables 2; references 7 (Russian).

Therapeutic Effect of Recombinant Human Interleukin-2 in Experimentally Induced Acute Radiation Sickness

957A0741C Moscow RADIATIONNAYA BIOLOGIYA RADIOEKOLOGIYA in Russian Vol 35 No 2, Mar-Apr 95 pp 237-243

[Article by S.A. Rogachev, Affiliate No. 1, Biophysics Institute; Russian Federation Ministry of Health, Chelyabinsk; manuscript received 5 Nov 93; UDC [57+61].599:539.1.047]

[FBIS Abstract] The therapeutic effect of recombinant human interleukin-2 [IL-2] in cases of experimentally induced radiation sickness was studied in experiments performed on 170 male CBA mice (age, 12 weeks; weight, 25 g) and 50 nonpedigree dogs of both sexes (weight, 11.5 +/- 0.4 kg). The animals were irradiated with an EGO-2 units. Some of the mice were irradiated at an exposure rate of 0.63 mA/kg, and the remainder of the mice and the dogs were irradiated at an exposure rate of 1.5 mA/kg. The IL-2 used was produced by the Biogen Interbranch Scientific-Technical Complex of the Organic Synthesis Institute of the Latvian Academy of Sciences in Riga and had a molecular weight of 15,000 kilodaltons and specific activity of 10⁷ units/mg protein. The IL-2 was injected into the irradiated animals subcutaneously three times daily for the first 5-6 days following irradiation beginning 6 hours after irradiation. The control animals received a physiologic solution of sodium chloride or a solution of native human albumin in a dose of 0.16 mg/kg/day in accordance with the same dosage regimen. The course of IL-2 as a treatment for acute radiation sickness was optimized by studying the dynamics of its colony-stimulating activity [CSA] in the blood serum of the irradiated dogs. The experiments established that in the period extending from 1 to 5 days after irradiation, the dogs' background serum CSA was depressed (in dogs irradiated in a dose of 4.0 Gy, CSA was depressed by as much as 40 percent of the starting level) and injection of a hematopoietic growth factor is indeed pathogenetically justified. The optimal dose of IL-2 in dogs was determined to be 3 x 10³ U/kg/day. In mice, on the other hand, the optimum dose of IL-2 was determined to be 20 x 10³ U/kg/day. When administered in the aforesaid optimum doses, IL-2 improved the survival rate of mice irradiated in a dose equal to 75 percent of the lethal dose [LD₇₅] to 100 percent and improved the survival rate of mice irradiated with a dose of radiation equal to LD₉₀ and the survival rate of dogs irradiated with a dose of radiation equal to LD₈₆ to 70 percent. A study of the mechanism of the therapeutic effect of IL-2 established that, above all, it caused accelerated restoration of the population of primary hematopoietic cells in irradiated

animals' bone marrow. In addition, IL-2 was also found to significantly alter postirradiation changes in the cellular profile of the peripheral blood. During the stage of development of postirradiation leukopenia, the leukocyte, neutrophil, and erythrocyte levels of the irradiated dogs that received IL-2 were respectively 3, 8-20, and 1.5 times higher than the corresponding levels of the dogs that were irradiated but not injected with IL-2. IL-2 also increased the irradiated dogs' blood levels of lymphocytes and thrombocytes over the levels in the control dogs. Figures 3, tables 4; references 11: 6 Russian, 5 Western.

Radiation-Induced Change in the Content and Fractional Composition of Nucleic Acids in Blood Plasma. Effect of Radioprotectors

957A0741D Moscow RADIATIONNAYA BIOLOGIYA RADIOEKOLOGIYA in Russian Vol 35 No 2, Mar-Apr 95 pp 244-249

[Article by S.S. Sherlina, A.S. Belokhvostov, S.N. Lebedev, and A.Ye. Antushevich, Military Medicine Scientific Research Institute, Russian Federation Ministry of Defense, St. Petersburg; manuscript received 6 May 93; UDC 557.391:547.962.322:612.398.12]

[FBIS Abstract] The effects of three different classes of radioprotectors, i.e., cystamine, gammaphos, and heparin, on the level and fractional composition of nucleic acids in the blood plasma of irradiated animals were examined in experiments performed on male nonpedigree white rats weighing 180 to 250 g each. The rats were irradiated on an IGUR unit with γ -quanta of ^{137}Cs in a dose of 8 Gy at a dose rate of 1.9 Gy/min ($\text{LD}_{50/30}$). Before being irradiated some of the rats were administered intraperitoneal injections of cystamine in a dose of 60 mg/kg or gammaphos in a dose of 200 mg/kg of body weight. The cystamine hydrochloride had been synthesized in 1992 at the Military Medicine Scientific Research Institute. The gammaphos (2,3-aminopropylaminoethylthiophosphate) had been synthesized at the Elementoorganic Compounds Institute of the USSR Academy of Sciences. A third group of rats received heparin in a dose of 50 U/kg of body weight 3 days before the irradiation sessions. The fractional composition of the nucleic acids of the animals' blood plasma was analyzed by electrophoresis in agarose gel or 2-16 percent gradient polyacrylamide gel in 0.04 M tris-acetate buffer (pH 7.7) containing 0.01 M ethylenediaminetetraacetic acid. The rats' blood plasma DNA levels were elevated after the animals had been irradiated: Five hours after the irradiation, the experimental rats' blood plasma contained more than twice as much DNA as the intact rats' blood plasma. Heparin did not have any statistically significant effect in the intact rats.

The radioprotectors cystamine and gammaphos, on the other hand, stimulated the release of DNA into the blood flow, resulting in normalization of the levels of DNA in the blood plasma of the irradiated rats. Five hours after the irradiation sessions, their blood plasma DNA levels were not significantly different from those of the intact rats. Furthermore, the elevation of DNA levels in the blood plasma was more pronounced in the rats given the cystamine and gammaphos injections than in the rats not protected by either of the two radioprotectors. Two hours after the irradiation sessions, the rats that had received the cystamine or gammaphos had 1.6 times more DNA in their blood plasma than did the irradiated rats that had not been injected with a radioprotector. Five hours after the irradiation, the protected rats contained 1.8 times more DNA in their blood plasma than the unprotected rats did. A more complex pattern emerged in the rats injected with heparin. Two hours after the irradiation sessions, the said rats' blood plasma levels of DNA were even lower than those of the unprotected animals. By 5 hours after the irradiation, however, their blood plasma levels of DNA were elevated as in the case of the rats receiving the other two radioprotectors. In the irradiated rats, neither cystamine nor gammaphos significantly changed the fractional profile of the rats' blood. In nonirradiated rats, on the other hand, cystamine and gammaphos induced a slight increase in the heterogeneous fraction of the blood. Cystamine caused a low-molecular-weight DNA fraction to appear in the blood of the nonirradiated rats into which it was injected. Neither heparin nor gammaphos induced the said fraction. Figures 3, table 1; references 8: 2 Russian, 6 Western.

Immunomorphological Study of the Effect of Ionizing Radiation on Nonlymphoid Structures of the Mouse Thymus With Monoclonal Antibodies

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[Article by O.I. Kuzmenov, L.V. Beletskaya, E.V. Gnezditskaya, and A.A. Yarin, Immunology Institute, Russian Federation Ministry of Health, Moscow, and Transplantology and Artificial Organs Institute, Russian Federation Ministry of Health, Moscow; manuscript received 13 Apr 94; UDC 576:539.1.04]

[FBIS Abstract] The immunomorphologic effect of ionizing radiation on the nonlymphoid structures of the mouse thymus was examined by using monoclonal antibodies [MoAbs] reacting with the cytokeratin of epithelial cells in conjunction with fluorescein isothiocyanate-labeled antibodies to immunoglobulins. The experiments were performed on the thymuses of (CBA x C57B1/6) F_1 laboratory mice weighing 20-22 g each.

Cryostatic sections (4-6 μm thick) of each thymus were examined by indirect immunofluorescence. Epithelial cells and Hassall bodies were identified by using the cytokeratin-specific MoAbs A6/1, A4/3, and A6/2. To eliminate possible impurities, all of the labeled preparations were first adsorbed by a homogenate of intact murine thymus tissue for 2 hours at room temperature. A LYMAN-2 luminescence microscope with a 40x lens (water immersion) was used to perform the studies. The animals were irradiated on a Stebel-3A γ -unit at an exposure rate of 5 Gy/min. The thymus tissue studies were performed between 1 day and 5 months after the irradiation sessions. Treatment of the cortical and medullary areas of the thymus glands of intact mice with the aforementioned MoAbs to antigens of the cytoplasm of the cells of the epithelial reticulum revealed only isolated, very thin projections of epithelial elements, with the intensity of the cell groups' luminescence measuring only 1-2 reference units. Irradiation of the mice at a dose of 2 Gy improved the brightness of the luminescence of the thymus epithelial reticulum by 3-4 reference units. Irradiation in a dose of 4 Gy resulted in the best demasking of the projections of epithelium reticulum cells by elim-

inating the lymphocytes. Fourteen days after irradiation of the thymus in doses of 0.5-2 Gy, the immunomorphologic pattern of the thymus stroma was restored and approximated that in intact animals. Fourteen days after irradiation at a dose of 4 Gy, on the other hand, progressive destruction of the thymus resulted and was accompanied by a decrease in its mass, truncation of the projections of epithelial cells (all the way to a total loss of the said cells), and the formation of continuous epithelial masses. Two months after irradiation, the epithelial reticulum of the substantia medullaris was found to contain a large number of round cysts (some as large as 100-200 μm in diameter) that were lined on the inside by luminescing cells of an epithelial nature. In 70 percent of the cases, the cavities were not filled. In the remaining 30 percent of cases, the chambers were filled with keratinized material surrounded by several layers of oval cells. Irradiation in doses of 10 and 15 Gy resulted respectively in significant attenuation and the total disappearance of reactions with the antibodies to antigens of the epithelial reticulum cells on day 1 after the irradiation. Figure 1; references 10: 5 Russian, 5 Western.

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